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SYSTRON DONNER

OPERATION AND SERVICE MANUAL

MODEL 4745

TRACKING PRESELECTOR

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SYSTRON DONNER CORP.
ONE SYSTRON DRIVE
CONCORD, CA 94518
USA

MODEL 4745
TRACKING PRESELECTOR

207-012

SYSTRON DONNER CORPORATION
INSTRUMENT GROUP

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WARRANTY

The Systron-Donner Tracking Preselector was in perfect working order at the time of shipment. Upon receipt, the unit should be carefully inspected. If the unit is damaged in any way, or fails to operate properly, a claim should immediately be filed with the shipping company.

The unit is warranted 1 year from date of shipment to the original purchaser to be free from defects in material and workmanship. This warranty does not apply to vacuum tubes, except as they are warranted by the tube manufacturer.

The liability of Systron-Donner under the warranty is limited to replacing or repairing any instrument or component thereof which is returned by the purchaser at his expense during the warranty period, provided that the unit has not been subjected to misuse, neglect, accident, or improper installation, repair, or alteration. Systron-Donner has the right of final determination as to the existence and cause of a defect.

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No agreement extending or modifying the warranty statement will be binding upon Systron-Donner unless such agreement is made in writing and signed by a duly authorized officer.

For assistance contact your local Scientific Devices Sales office, Systron-Donner Customer Service office or International Distributor.

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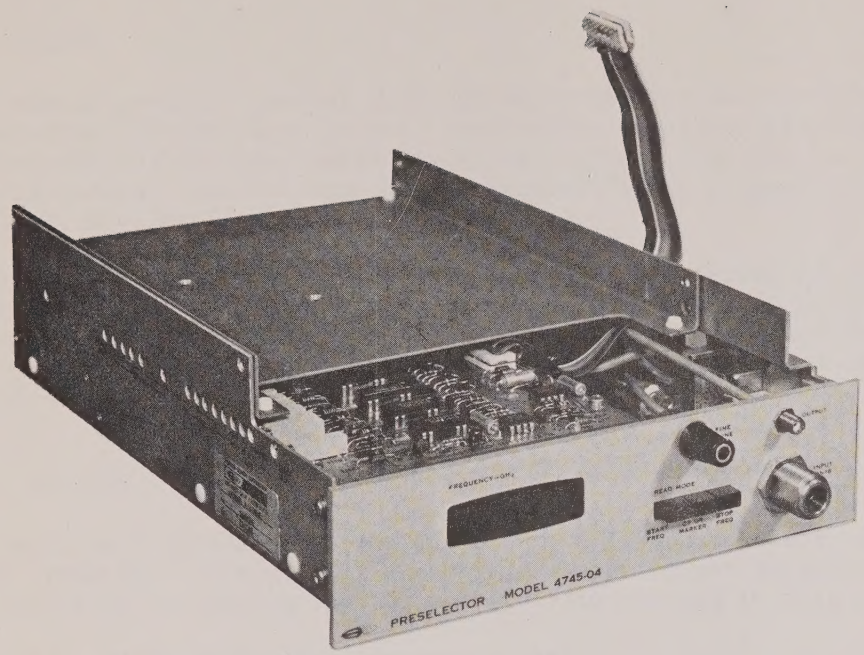

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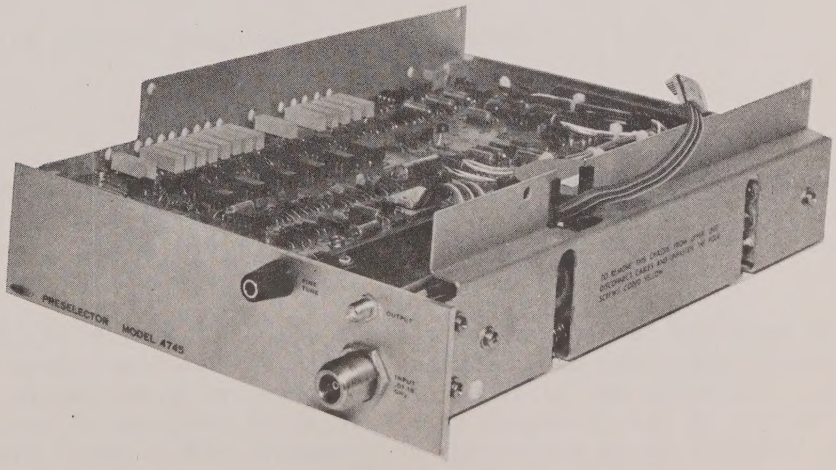

MODEL 4745-02

Figure 1-1. Model 4745 Tracking Preselector

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SECTION I

GENERAL DESCRIPTION

1-1. SCOPE

This manual provides general information, installation instructions, operation instructions, circuit descriptions, performance check and adjustment procedures, maintenance instruction, parts lists, and circuit diagrams for the Model 4745 Tracking Preselector, manufactured by the Systron-Donner Corporation, 14844 Oxnard Street, Van Nuys, California 91411.

The Model 4745 Tracking Preselector, hereinafter referred to as the Model 4745, is shown in figure 1-1. The unit is attached to a microwave tuning unit (Model 4809 or equivalent), which is installed in a Model 2311 or 2312 Display Unit, to form part of a Microwave Spectrum Analyzer System that also includes a sweep control unit (Model 4701 or equivalent).

1-2. OPTIONS

The basic unit contains a tracking filter, a low-pass filter, and a Type N female INPUT connector. The digital frequency readout is not included in the basic unit. The following options to the basic unit (also covered in this manual) are available:

-01. Basic unit, less low-pass filter

-02. Basic unit with Type N INPUT connector replaced by an APC-7 sexless connector.

-03. Digital frequency readout only. Tracking and low-pass filters are deleted.

-04. Basic unit with digital frequency readout added.

1-3. PURPOSE AND FUNCTION

In a Systron-Donner Microwave Spectrum Analyzer System, when operating in the frequency range from 10 MHz to 18.0 GHz (bands 1 through 7), the Model 4745 greatly reduces undesired responses, which, under certain conditions, tend to clutter the display on the CRT in the display unit.

When operating in band 1 (10 MHz to 1.8 GHz), a low-pass filter (not included in options -01 and -03) in series with a 3 dB pad is inserted into the signal path between the source of the signal being analyzed and the input to the microwave tuning unit. This low-pass filter is designed to reject image response, and to prevent the base line shift that would occur if the frequency of the signal being analyzed is exactly equal to the first IF frequency of the tuning unit.

When operating in bands 2 through 7 (1.75 GHz to 18.0 GHz), a three-pole, tunable band-pass filter (not included in option -03) is inserted into the signal path between the source of the signal being analyzed and the input to the microwave

tuning unit. This filter is electronically tuned in synchronism with the frequency sweep of the microwave tuning unit.

Image responses and harmonic responses other than the harmonic response chosen to be the main response for the band being selected are eliminated by the tunable bandpass filter (tracking filter).

In addition, for options -03 and -04 only, a digital frequency readout is provided. Depending upon the front panel Read Mode selection, one of the following is displayed on the 3½-digit panel meter:

- The start frequency (in GHz) of the sweep in the tuning unit (the frequency that corresponds to the left-hand edge of the CRT display in the display unit).
- The center frequency (in GHz) of the sweep in the tuning unit (the frequency that corresponds to the center of the CRT display in the display unit).
- The stop frequency (in GHz) of the sweep in the tuning unit (the frequency that corresponds to the right-hand edge graticule of the CRT display in the display unit).
- In the marker mode of operation (selected by the sweep control unit), the frequency (in GHz) of the marker (the frequency that corresponds to the marker spot on the CRT display in the display unit).
- The frequency (in GHz) to which the tuning unit is tuned when operating in the Zero Span, or Fast Sweep modes.

1-4. SPECIFICATION DATA (table 1-1)

Table 1-1 provides specification data for the Model 4745.

TABLE 1-1. SPECIFICATIONS

ITEM NO.	ITEM	SPECIFICATION
1A	Electrical Power Requirements	±24V and +10V unregulated dc voltages from power supply in display units.
2	Input Signal (not applicable for option -03):	
2A	Frequency Range	DC to 18.0 GHz.
2B	Maximum Safe Input Power	+20 dBm. (Not to exceed tuning unit input power rating).
2C	Input Impedance	50 ohms nominal.
2D	VSWR	Less than 2 (typical).
2E	Connector	Type N (female); for option -02, an APC-7 sexless connector is used.

TABLE 1-1. SPECIFICATIONS (Continued)

ITEM NO.	ITEM	SPECIFICATION
3	Low Pass-Filter for Band 1 (not included in options -01 and -03)	
3A	Passband	DC to 1.8 GHz.
3B	Passband Ripple	±0.5 dB.
3C	Passband Insertion Loss	4 dB Max.
3D	Out-of-Band Rejection	More than 60 dB from 2.05 GHz to 10 GHz. More than 30 dB from 10 GHz to 18 GHz.
4	Tracking Filter for Bands 2 through 7 (not included in option -03)	
4A	Frequency Range	1.75 GHz to 18.0 GHz.
4B	MAX Linear Input Power	+10 dBM.
4C	Type	3-pole, YIG-tuned.
4D	Bandwidth (3 dB minimum) and Passband Insertion Loss	Frequency / Bandwidth / Insertion Loss 1.8 GHz / 20 MHz / Less than 7 dB 10 GHz / 35 MHz / Less than 8 dB 18 GHz / 50 MHz / Less than 10 dB
4E	Passband Spurious and Ripple	Less than 1.5 dB.
5	Control Inputs:	
5A	Counter Gate	TTL high required to gate meter (marker mode).
5B	Blank Pulse	This TTL logic level goes high during the horizontal retrace interval between sweeps.
5C	Marker Control	When marker mode is not selected on sweep control unit, this line is switched to 0 volt (ground). When marker mode is selected, the line is open.

TABLE 1-1. SPECIFICATIONS (Continued)

ITEM NO.	ITEM	SPECIFICATION
5D	Band Select Signals	Separate select lines are provided from the tuning unit for bands 1 through 7. A -15 volt signal on one of these lines selects the corresponding band in the Model 4745.
5E	Tuning Voltage	This signal, having a range from -4 to -8 volts, is supplied from the tuning unit.
5F	Dispersion Sweep Signal	-2.6 to +2.6 volt dispersion sweep signal from sweep control unit, which is used to define the frequency sampling point for the digital frequency readout.
6	Digital Frequency Readout (options -03 and -04 only)	
6A	Number of Digits	4
6B	Measurement Range (GHz)	0.000 through 1.999 for Band 1; 00.00 through 19.99 for Bands 2 through 7.
6C	Meter Accuracy	±.1% ±10 MHz ±1 Digit

1-5. PHYSICAL DESCRIPTION (figure 1-2)

Mounted to the chassis of the Model 4745 are the low-pass filter (FL401) for Band 1 (not included in options -01 and -03), the tunable filter (Y401) and tuning current driver (Q401) for bands 2 through 7 (not included in option -03), the coaxial switches (S401 and S402) for switching between FL401 (Band 1) and Y401 (Bands 2 through 7) (not included in option -03), and (for option -03 and -04) a +5 volt power supply (VR401). Preselector Control printed circuit board PCB401 (not included in option -03) contains the control circuits for tunable filter Y401.

Connector P401 mounted on the rear of the unit, provides the means for connecting the Model 4745 into the display unit wiring harness. Wiring from this connector is hard-wired to PCB401, PCB402, and to the chassis-mounted components. A flat ribbon cable from PCB401 terminates in connector P1, which connects to the mating connector on the tuning unit.

If the Digital Frequency Readout is included (options -03 and -04 only), a flat ribbon cable from PCB401 connects to connector J2 of the Meter Interface printed circuit board (PCB402), which is mounted below PCB401. Connector J1 of PCB402 physically connects to P1 of Digital Panel Meter M401.

Mounted to the front panel are INPUT connector J401, OUTPUT connector J402, and FINE TUNE control R402. These three items are omitted in option -03. For options -03 and -04, the front panel includes FREQUENCY meter M401 (digital panel meter), and READ MODE controls S403 (START FREQ), S404 (CF OR MARKER), and S405 (STOP FREQ).

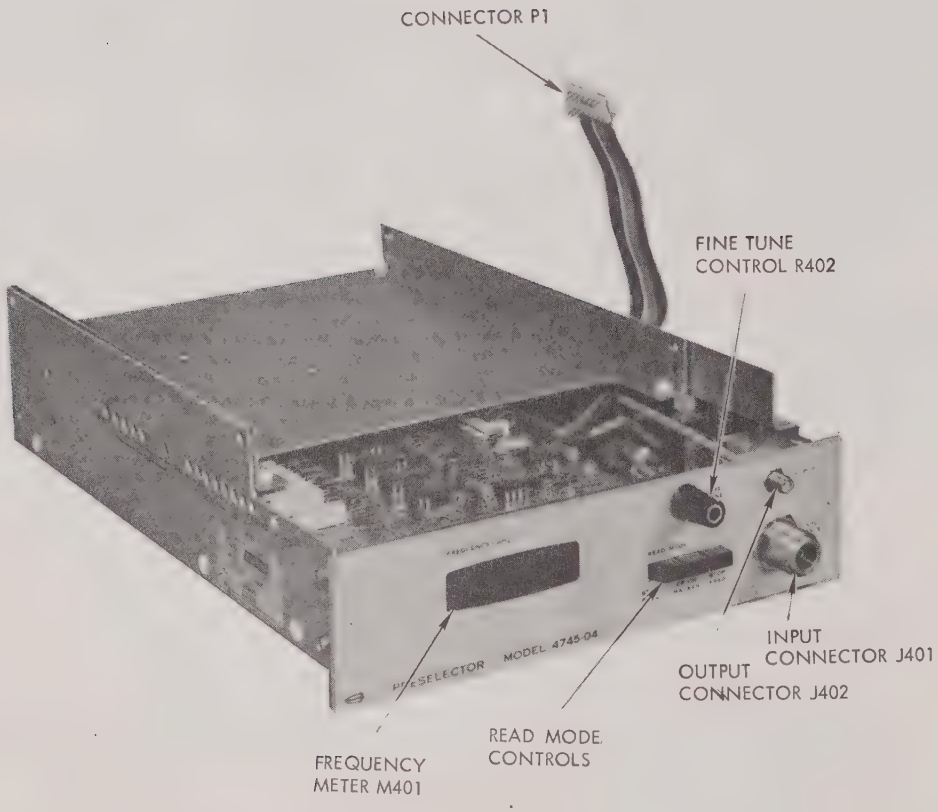


Figure 1-2. Location of Major Components

SECTION II

INSTALLATION

2-1. GENERAL

This section contains instructions for installing the Model 4745 onto a Model 4809 (or equivalent) Microwave Tuning Unit.

NOTE

Refer to Section V for calibration instructions.

2-2. MOUNTING AND ELECTRICAL CONNECTIONS

To mount the Model 4745 to a Model 4809 (or equivalent) Microwave Tuning Unit, proceed as follows:

1. Assure that connector P1 on the flat ribbon cable from Preselector Control PCB401 extends through the hole on the right side of the Model 4745 chassis.

2. Turn the tuning unit upside down, and remove blank chassis by removing 4 screws. Place the Model 4745 chassis over the bottom cover of the tuning unit, and align the Model 4745 front panel with the tuning unit front panel.

3. Insert two screws on each side of the Model 4745 to secure the chassis to the tuning unit.

4. Connect connector P1 of the flat ribbon cable (described in step 1) to connector A208J1 on the right side of the tuning unit.

2-3. AMPLITUDE CALIBRATION (NOT APPLICABLE TO OPTION -03)

In the logarithmic measurement mode of operation, the tuning unit (Model 4809 or equivalent) band gain adjustments are set for a log reference level of -30 dBm on each band. That is, a -30 dBm signal applied to the input of the tuning unit produces full-scale deflection on the CRT when there is no RF or IF attenuation. If it is desired to retain the absolute amplitude calibration of the spectrum analyzer while operating with the Model 4745, the -30 dBm reference level must be referred to the input of the Model 4745 rather than the input of the tuning unit. This is necessary because of the insertion loss of the Model 4745, as defined in items 3C and 4C of table 1-1. To perform the amplitude calibration, perform the following procedure for each frequency band (bands 1 through 7).

1. Perform the Fourth Converter Board adjustments (A202) for the Model 4809, adjusting R12 to bring the signal down 5 dB from maximum amplitude rather than the 11 dB down specified.

2. Connect a calibrated signal generator to the INPUT connector of the Model 4745. For bands 1 through 5, connect the rigid coax cable supplied from the OUTPUT connector of the Model 4745 to the RF INPUT connector of the tuning unit. For bands 6 and 7, connect the appropriate waveguide mixer

through a W/G-to-coax transistion to the Model 4745 OUTPUT connector, and connect the supplied external mixer cable from the output of the external mixer to the EXT MXR connector on the tuning unit.

3. Introduce 10 dB of input attenuation in the tuning unit, and set up the calibrated signal generator for a -20 dBm unmodulated output at a frequency that is near the center frequency of the band being adjusted. For band 7 set the signal generator frequency to 18 GHz.

4. Set up the sweep control unit for a 3 msec/division free-running sweep.

5. On the tuning unit, select the band being adjusted, and tune the tuning unit to the frequency of the calibrated signal generator, so that the signal is centered on the display.

6. Set up the tuning unit with Zero IF attenuation, automatic bandwidth, and a scanwidth of 500 KHz/division in the logarithmic mode.

7. On the Model 4745, adjust the FINE TUNE control for optimum signal response on the display (not applicable for band 1).

8. On the tuning unit, adjust the Band Gain Adjustment for the band being adjusted so that the signal peak is full scale. For the Model 4809 Microwave Tuning Unit, the Band Gain Adjustments are as follows:

Band	Adjustment on Board A208
1	R11
2	R12
3	R13
4	R14
5	R15
6	R6
7	R7

SECTION III
OPERATION

3-1. GENERAL

This section provides operation instructions for the Model 4745. Refer to the applicable display unit, microwave tuning unit, and sweep control unit manuals for operation of these units.

3-2. OPERATOR CONTROLS (figure 3-1 and table 3-1)

The operator controls are illustrated in figure 3-1, and are listed and described in table 3-1.

3-3. OPERATION INSTRUCTIONS

The paragraphs that follow provide operating instructions for the Model 4745. Power is applied to the Model 4745 whenever power is applied to the display unit by operating the POWER switch on the sweep control unit.

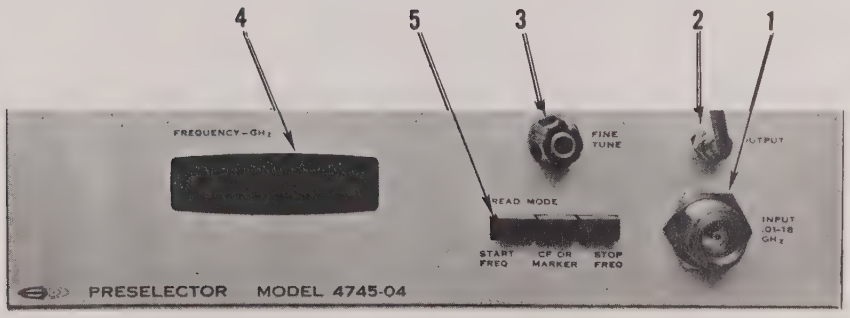


Figure 3-1. Location of Controls and Indicators

TABLE 3-1. OPERATOR CONTROLS AND INDICATORS

CONTROL/INDICATOR (Figure 3-1)	DESCRIPTION
1. INPUT connector J401 (not included in option -03)	The input connection point for the signal being analyzed.
2. OUTPUT connection J402 (not included in option -03)	The filtered output of the Model 4745 is made available at this connector for connection to the tuning unit.
3. FINE TUNE control R402 (not included in option -03)	Provides fine tuning of the tracking filter for bands 2 through 7.
4. FREQUENCY meter M401 (options -03 and -04 only)	Indicates the frequency (in GHz) of the frequency being selected by the READ MODE switches. For band 1, the meter indicates the frequency in the range from 0.010 to 1.999 GHz. For bands 2 through 7, the meter indicates the frequency in the range from 01.75 to 19.99 GHz.
5. READ MODE interlocked switches: (options -03 and -04 only)	
START FREQ	When not operating in the fast sweep, narrow scan, or zero scan modes and this button is pressed, the FREQUENCY meter displays the frequency that corresponds to the left-hand edge of the display. If the spectrum analyzer is operating in the zero scan or fast sweep mode, no readout is produced. If the spectrum analyzer is operating in the narrow-scan mode, the FREQUENCY meter displays the frequency to which the tuning unit is tuned.
CF OR MARKER	If the spectrum analyzer is operating in the marker mode and this button is pressed, the FREQUENCY meter displays the frequency that corresponds to the location of the marker spot on the display. If the spectrum analyzer is not operating in the marker mode and this button is pressed, the FREQUENCY meter displays the frequency that corresponds to the center frequency of the display, or (if operating in the narrow-scan, fast sweep, or zero scan mode) the frequency to which the tuning unit is tuned.

TABLE 3-1. OPERATOR CONTROLS AND INDICATORS (Continued)

CONTROL/INDICATOR (Figure 3-1)	DESCRIPTION
STOP FREQ	When not operating in the fast sweep, narrow scan, or zero scan modes and this button is pressed, the FREQUENCY meter displays the frequency that corresponds to the right-hand edge of the display. If the spectrum analyzer is operating in the zero span or fast sweep mode, no readout is produced. If the spectrum analyzer is operating in the narrow scan mode, the FREQUENCY meter displays the frequency to which the tuning unit is tuned.

3-3.1 SIGNAL CONNECTIONS (NOT APPLICABLE FOR OPTION -03)

Connect the signal being analyzed to the INPUT connector on the front panel. If the the signal being analysed is in bands 1 through 5, connect the supplied semi-rigid coaxial cable from the OUTPUT connector on the front panel to the RF INPUT connector of the tuning unit. If the signal being analyzed is in band 6 or 7, connect the input of the external waveguide mixer to the OUTPUT connector on the front panel, through a W/G-to-Coax transition and connect the supplied external mixer cable from the output connector of the external mixer to the EXT MXR connector on the tuning unit.

3-3.2 FINE TUNING FOR BANDS 2 THROUGH 7 (NOT APPLICABLE FOR OPTION -03)

If the signal being analyzed is in bands 2 through 7, and after tuning the tuning unit to the frequency of the signal being analyzed, adjust the FINE TUNE control on the Model 4745 to obtain maximum signal response on the display.

3-3.3 DIGITAL FREQUENCY READOUT (OPTIONS -03 AND -04 ONLY)

The READ MODE switches on the front panel permit selection of the frequency that is displayed in the FREQUENCY meter. Table 3-1 defines the frequency that is selected by the START FREQ, CF OR MARKER, AND STOP FREQ switches.

SECTION IV

CIRCUIT DESCRIPTIONS

4-1. FUNCTIONAL DESCRIPTION

4-1.1 OPERATION OF TRACKING FILTER ON BANDS 2 THROUGH 7

To cover the entire frequency range from 10 MHz to 40 GHz, most microwave tuning units (such as the Model 4809) must employ harmonic mixing. For any given input signal having frequency F_{IN}, a response is produced on the display when the difference signal (produced by mixing a harmonic of the swept local oscillator frequency (F_{LO}) with the input signal) has a frequency that is equal to the intermediate frequency (F_{IF}). That is, a response is produced when:

$$HF_{LO} = F_{IN} \pm F_{IF} \qquad (1)$$

Where:

H = the harmonic mixing mode of the swept local oscillator fundamental frequency. The sign indicates whether F_{LO} is above (-) or below (+) F_{IN}.

F_{LO} = the fundamental frequency of the swept local oscillator,

F_{IN} = the frequency of a component of the signal being analyzed,

$\pm F_{IF}$ = the intermediate frequency. The $\pm$ indicates whether HF_{LO} is above (-) or below (+) F_{IN}; as determined by the sign of the harmonic mixing mode (H).

On any given frequency band, a particular harmonic mixing mode is chosen as the main response. For example, in the Model 4809 Microwave Tuning Unit, the following harmonic mixing modes are chosen:

Band	Harmonic Mixing Mode (H)
1	1-
2	1-
3	2-
4	3-
5	3+
6	4+
7	6+
8	10+

For any given values of the input frequency (F_{IN}) and the intermediate frequency (F_{IF}), equation (1) will be satisfied at numerous local oscillator frequencies. For example, if an input signal with a frequency of 12 GHz is being analyzed on band 5, a response would be produced at the following values of F_{LO}, assuming a local oscillator sweep from 2 GHz to 4 GHz, and an intermediate frequency (F_{IF}) of 2 GHz:

F_{LO} (GHz)	Harmonic Mixing Mode (H)
2.000	5+ and 7-
2.325	6-
2.500	4+
2.800	5-
3.333	3+
3.500	4-

The main response would be produced at 3.333 GHz, since, as noted previously, the 3+ harmonic mixing mode is chosen (in the Model 4809) for band 5, because it has the lowest harmonic number, and, therefore, offers the highest sensitivity. Although the other responses are valid, they are undesired, and serve only to clutter the display.

In the example just described, the Model 4745 would be tuned to 12 GHz only when the value of F_{LO} is 3.333 GHz (3+ harmonic mixing mode). At all other values of F_{LO}, the Model 4745 would be tuned to some other frequency, preventing the input signal from reaching the tuning unit mixer, and thereby greatly reducing undesired responses.

When operating on bands 2 through 7, a YIG-tuned tracking filter is inserted between the signal input to the Model 4745 and the signal output to input of the tuning unit. The tuning current for this filter is derived from the same tuning voltage used to sweep the local oscillator in the tuning unit, consequently, the local oscillator in the tuning unit and the tracking filter in the Model 4745 are swept in synchronism, such that the following equation is satisfied:

$$F_{TF} = HF_{LO} \pm F_{IF} \qquad (2)$$

Where:

F_{TF} = the tuned frequency of the tracking filter in the Model 4745 at any given instant during the frequency sweep,

H = the harmonic mixing mode chosen as the main response for the band on which the spectrum analysis is being performed. The sign indicates whether F_{LO} is above (-) or below (+) F_{TF},

F_{LO} = the fundamental frequency of the swept local oscillator in the tuning unit at any given instant in the frequency sweep,

$\pm F_{IF}$ = the intermediate frequency. The $\pm$ indicates whether HF_{LO} is above (+) or below (-) F_{TF}, as determined by the sign of the harmonic mixing mode (H).

When the tuned frequency (F_{TF}) of the tracking filter is equal to a frequency component (F_{IN}) of the input signal being analyzed, a response is produced on the display.

4-1.2 OPERATION OF DIGITAL FREQUENCY READOUT (OPTIONS -03 AND -04 ONLY)

The digital frequency readout is obtained by sampling and digitizing one of the following.

- When operating on band 1, the tuning voltage used to sweep the local oscillator in the tuning unit is sampled and digitized.

- When operating on bands 2 through 7, the tuning voltage used to sweep the tracking filter in the Model 4745 is sampled and digitized.

The point in the frequency sweep where the the tuning voltage is sampled and digitized is determined by the read mode of the Digital Frequency Readout.

When the spectrum analyzer system is not operating in the slow sweep (300 msec/division), fast sweep (usec/division) or marker modes, a reference voltage established by the selected read mode is compared to the magnitude of the dispersion sweep voltage from the sweep control unit. During each frequency sweep of the tuning unit, the dispersion sweep voltage increases linearly from -2.6 volts to +2.6 volts.

When the dispersion sweep voltage has a value of -2.5 volts (start frequency), 0 volt (center frequency), or +2.5 volts (stop frequency), the selected reference voltage is equal in magnitude to the dispersion sweep voltage, and a zero crossing detector produces a sample gate. The sample gate allows the tuning voltage (for the local oscillator in the tuning unit or the tracking filter in the Model 4745, as determined by the selected band) to be sampled and stored in a capacitor.

The voltage stored on the capacitor is then periodically digitized by the digital panel meter, which functions as an analog-to-digital converter. The resulting digitized value is displayed in the FREQUENCY readout.

4-2. DETAILED CIRCUIT DESCRIPTIONS

4-2.1 FILTER CIRCUITS (figure 4-1)

Figure 4-1 is a simplified block diagram showing the tracking filter for bands 2 through 7, the low-pass filter for band 1, and the control circuits associated with the tracking filter.

Operation of the Filter Circuits is determined by which BAND ENABLE signal (from the tuning unit) is active. The activated (-15 volt) BAND ENABLE line energizes the associated Band Select Relay (K1 through K7) on the Preselector Control PCB.

When band 1 is selected (relay K1 energized), coaxial switches S401 and S402 are de-energized, and the signal input is routed from INPUT connector J401 through low-pass filter FL401 and 3-dB pad AT401 to OUTPUT connector J402.

When band 1 is not selected (K1 de-energized), coaxial switches S401 and S402 are energized, and the signal input is routed from INPUT connector J401 through tracking filter Y401 to OUTPUT connector J402.

In this case, the tuning current through the tuning coil of Y401 determines the resonant frequency of the filter, and the remainder of the circuits shown on figure 4-1 are operative.

When a band 2 through 7 BAND ENABLE signal from the tuning unit is active (-15 volts), one of the band 2 through 7 select relays (K2 through K7) is energized. The energized relay performs the following selection functions:

- The Band Scaling-High potentiometer for the selected band is connected from the output of Tuning Voltage Amplifier A1 to the input of Rate Control A4.

- The Band Preset-Low potentiometer for the selected band is connected from the output of -10-Volt Reference Supply A2, Q1 to one input of Summing Amplifier A3.

The Band Preset-Low potentiometer selected by the Band Select Relays applies a negative voltage (derived from the 10-Volt Reference Supply) to the + input of Summing Amplifier A3. This negative voltage is set by the potentiometer so that, at the start of the frequency sweep on the associated band, the tuning current applied to tracking filter Y401 has the magnitude required to tune the tracking filter to the frequency that corresponds to the low end of the sweep.

The -4 to -8 volt local oscillator tuning voltage (L.O. TUNE) from the tuning unit is applied to Tuning Voltage Amplifier A1, which produces TUNE voltage, having a range (at test point TP1) of 0 to +8 volts. The TUNE voltage is applied through the Band Scaling-High potentiometer selected by the Band Select Relays to the input of Rate Control A4. The TUNE voltage is scaled by the potentiometer so that, at the end of the frequency sweep on the associated band, the tuning current applied to tracking filter Y401 has the magnitude required to tune the tracking filter to the frequency that corresponds to the high end of the sweep

Rate Control A4 is a speed-up circuit used to compensate for the lag occurring in the YIG filter due to eddy current effects. Fast adjustment R97 is adjusted to compensate for the current lag.

The scaled, rate-compensated sweep voltage output of Rate Control A4 is applied to Summing Amplifier A3, where it is summed with the following voltages:

- The negative voltage from the Band Preset-Low potentiometer selected by the Band Select Relays.

- The voltage from FINE TUNE control R402.

The YIG VOLTAGE output of Summing Amplifier A3 is scaled by Scale Adjust potentiometer R83 and applied to a current driver consisting of amplifier A5 and transistors Q4 and Q401. The YIG tuning current produced by Q401 is applied to the tuning coil of tracking filter Y401.

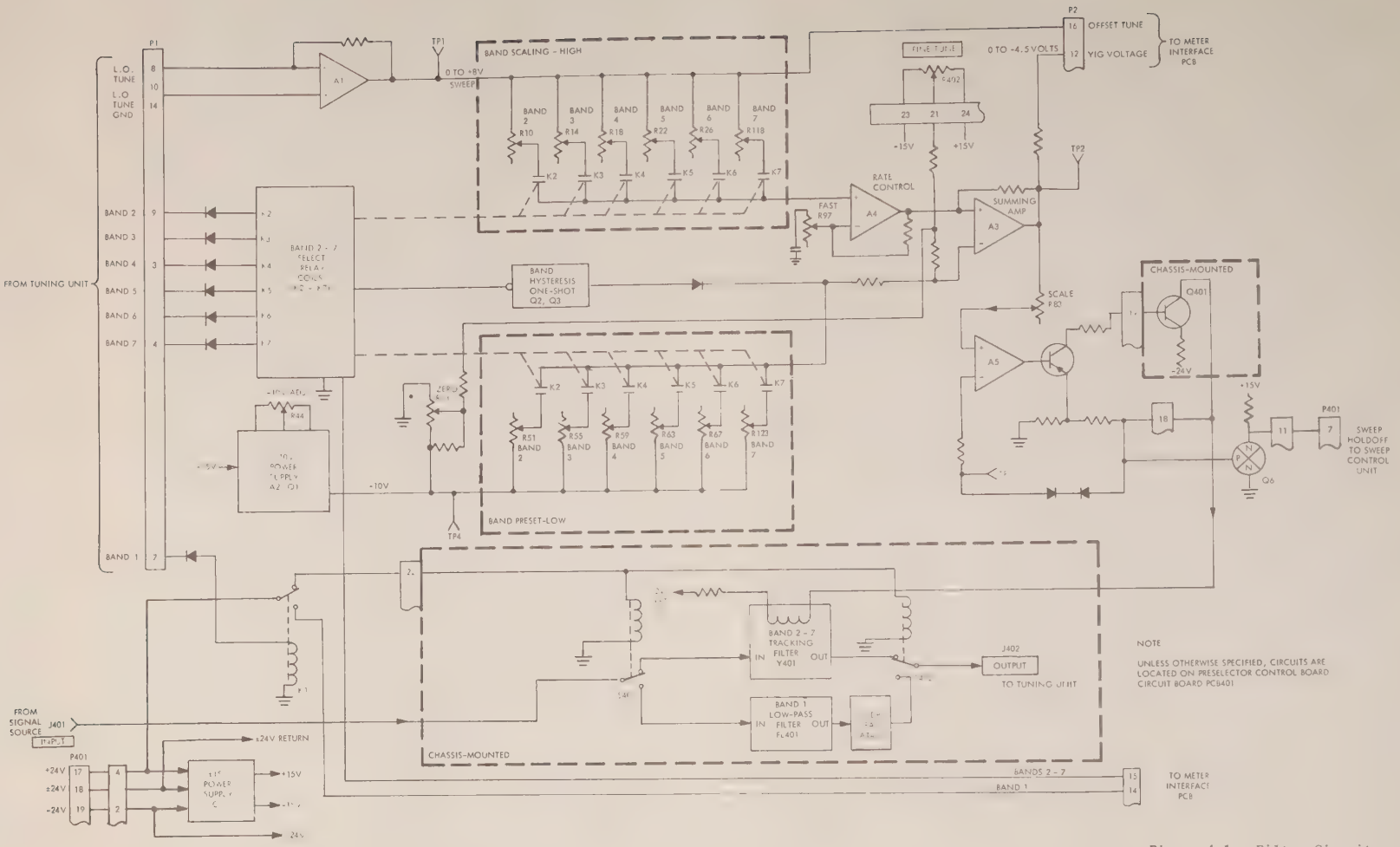


Figure 4-1. Filter Circuit

When a new band selection is made at the tuning unit, a negative-going BAND SWITCH PULSE is produced by the Band Select Relays. This negative pulse triggers Band Hysteresis One-Shot Q2, Q3, which applies a band 2 preset voltage to Summing Amplifier A3. Consequently, whenever a band change is made, the tracking filter is initialized at the low end of band 2 until all circuits have stabilized.

4-2.2 DIGITAL FREQUENCY READOUT CIRCUITS (figure 4-2)

As shown in figure 4-2, the Digital Frequency Readout Circuits are functionally divided as follows:

- Sample Control, which generates the sample gate, and selects whether the YIG VOLTAGE (bands 2 through 7) or the TUNE voltage (band 1) is sampled.
- Signal Conditioning Circuits, which condition the YIG VOLTAGE and TUNE voltage inputs.
- Sample and Hold Circuits, which sample and store the voltage from the source selected by the Sample Control when the sample gate occurs. The sampled voltage is digitized and displayed by digital panel meter M401.
- Unblanking Logic, which controls blanking and unblanking of the display produced by digital panel meter M401.

4-2.2.1 SAMPLE CONTROL. The Sample Control produces either the BAND 2 through 7 SAMPLE GATE or the BAND 1 SAMPLE GATE to initiate a sample and hold action by the Sample and Hold Circuits.

If band 1 is being selected, band 1 Switch Q6 is turned off, enabling the BAND 1 SAMPLE GATE, and band 2 through 7 Switch Q7 is turned on, inhibiting the BAND 2 through 7 SAMPLE GATE. Also, the X.XXX Decimal point line to the digital panel meter is high. If band 2, 3, 4, 5, 6, or 7 is being selected, band 2 through 7 switch Q7 is turned off, enabling the BAND 2 through 7 SAMPLE GATE, and band 1 Switch Q6 is turned on, inhibiting the BAND 1 SAMPLE GATE. Also, the XX.XX decimal point line to the digital panel meter is high.

When enabled, the BAND 1 or BAND 2 through 7 SAMPLE GATE becomes active (high) when either SWEEP SAMPLE GATE or COUNTER GATE SELECT becomes active as discussed in the subparagraphs that follow.

4-2.2.1.1 CF OR MARKER Read Mode Selected, and COUNTER GATE is High. When CF OR MARKER is selected and the COUNTER GATE from the sweep control unit is high, COUNTER GATE SELECT becomes active to produce the selected SAMPLE GATE. The COUNTER GATE signal from the sweep control unit is high when any of the following conditions exist:

- The sweep control unit is operating in the Marker Mode, and (on alternate sweeps) the marker spot is being displayed. In this case, STROBE is high (open) as a result of the Marker Mode being selected, turning on Sweep Sample Inhibit Q5, continuously. With Q5 turned on, SWEEP SAMPLE WINDOW is inhibited. The fixed OFFSET TUNE voltage or YIG VOLTAGE that exists while the marker spot is being displayed is sampled and stored by the Sample and Hold Circuits.

- The sweep control unit is operating in the slow sweep (300 msec/division) mode. In this case, COUNTER GATE, COUNTER GATE SELECT, and the selected SAMPLE GATE are high continuously. Consequently the Sample and Hold Circuits are enabled continuously. In this case, the digital panel meter digitizes random values of the swept frequency, or (if operating in the Zero Span Mode) the frequency to which the tuning unit is tuned.

- The sweep control unit is operating in the fast sweep (usec/division) mode. In this case, COUNTER GATE, COUNTER GATE SELECT, and the selected SAMPLE GATE are high continuously. Consequently, the Sample and Hold Circuit are enabled continuously. In this case, the tuning unit operates in the Zero Span Mode, and the digital panel meter digitizes the frequency to which the tuning unit is tuned.

4-2.2.1.2 CF OR MARKER Read Mode Selected, Marker Mode Not Selected, and COUNTER GATE is low. In this case, COUNTER GATE SELECT is inhibited, enabling the SWEEP SAMPLE GATE. When the SWEEP SAMPLE WINDOW becomes active, the selected SAMPLE GATE goes high, enabling a sample and hold action.

SWEEP SAMPLE WINDOW becomes active when both of the following conditions are satisfied:

- The BLANKING input from the sweep control unit is low. In this case, Sweep Sample Inhibit Q5 is turned off, enabling ZERO CROSSING.

- The DISPERSION sweep voltage from the sweep control unit is within $\pm$20 mv of the zero voltage point that corresponds to the center frequency. When the DISPERSION sweep voltage is in this range, Crossing Detectors A1 and A2 both produce high outputs at test points TP4 and TP5. A -20 mv reference level for Plus Crossing Detector A1 is established by +Det Gate Adjust R33. Thus A1 produces a high output at TP4 when the DISPERSION sweep is more positive than -20 mv. A +20 mv reference for Minus Crossing Detector A2 is established by -Det Gate Adjust R34, thus A2 produces a high output at TP5 when the DISPERSION sweep is more negative than +20 mv.

4-2.2.1.3 START FREQ or STOP FREQ Read Mode Selected. In this case, COUNTER GATE SELECT is inhibited, enabling the SWEEP SAMPLE GATE. When SWEEP SAMPLE WINDOW becomes active, the selected SAMPLE GATE goes high, enabling a sample and hold action.

If the BLANKING input from the sweep control unit is low, Sweep Sample Inhibit Q5 is turned off, enabling SWEEP SAMPLE WINDOW. Then, SWEEP SAMPLE WINDOW becomes active when either of the following conditions occurs:

- The START FREQ Read Mode is selected, and the DISPERSION sweep voltage is within $\pm$ 20 mv of the start frequency reference voltage selected by Start Frequency Reference Switch Q3, Q4, and scaled by Start Sweep Adjust R15. When this condition exists, Crossing Detectors A1 and A2 both produce high outputs.

- The STOP FREQ Read Mode is selected, and the DISPERSION sweep voltage is within $\pm$ 20 mv of the stop frequency reference voltage selected by Stop Frequency Reference Switch Q1, Q2, and scaled by Stop Sweep Adjust R11.

When this condition exists, Crossing Detectors A1 and A2 both produce high outputs.

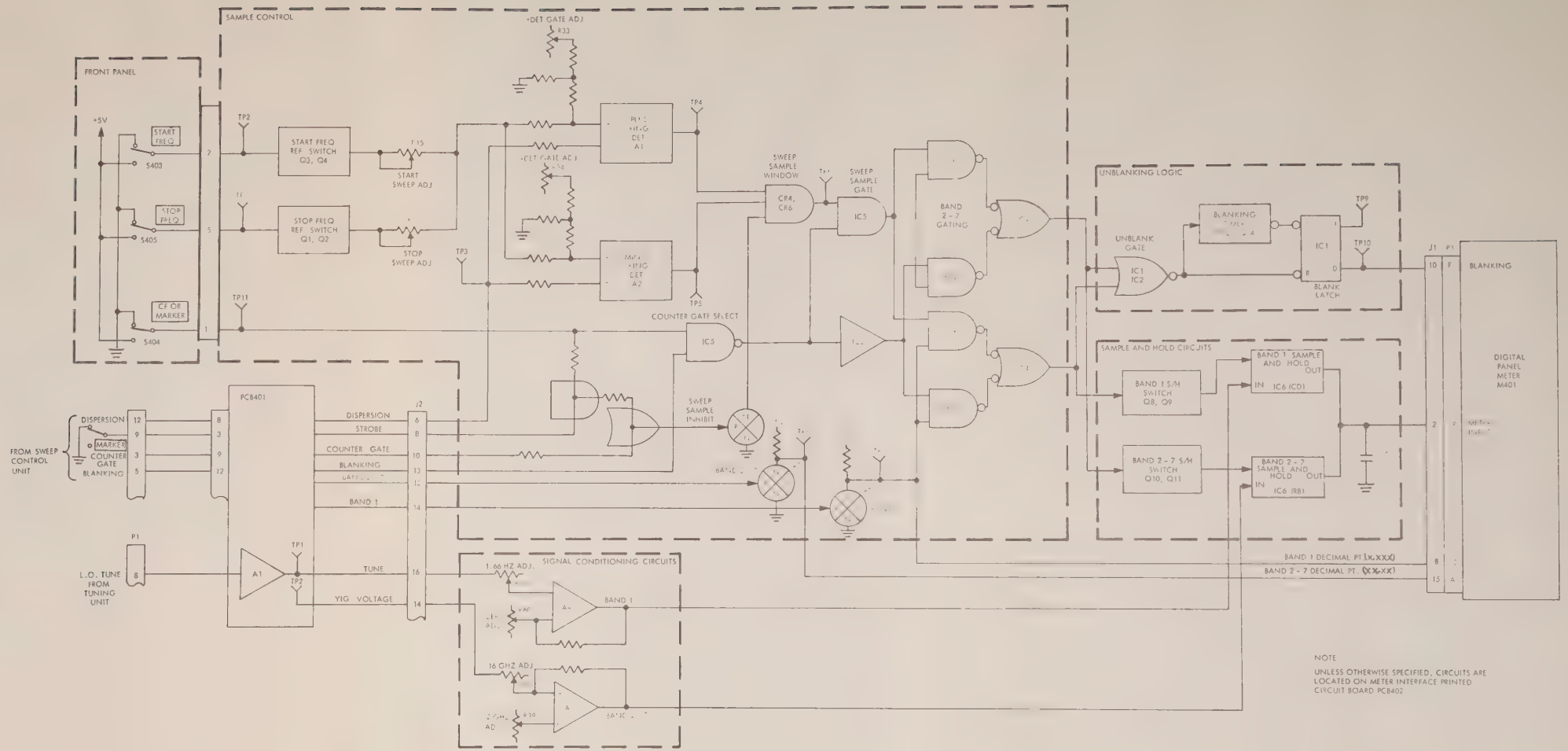


Figure 4-2. Digital Freq. Readout Circuits

4-2.2.2 UNBLANKING LOGIC. Whenever BAND 2 through 7 SAMPLE GATE or BAND 1 SAMPLE GATE from the Sample Control goes high, the Blank Latch is reset, producing a high BLANKING signal to the digital panel meter, unblanking the display. When both the BAND 2 through 7 SAMPLE GATE and the BAND 1 SAMPLE GATE are low, Blanking Timer Q12 through Q14 begins a timeout. If neither BAND 2 through 7 SAMPLE GATE nor BAN D 1 SAMPLE GATE goes high before the timeout is complete, the Blank Latch is set, producing a low BLANKING output to the digital panel meter, blanking the display.

4-2.2.3 SIGNAL CONDITIONING CIRCUITS. The TUNE voltage used for frequency readout on band 1 is applied to Band 1 Amplifier A4, and the YIG VOLTAGE used for frequency readout on bands 2 through 7 is applied to Band 2 through 7 Amplifier A3. These amplifiers convert the input voltages to outputs in the range between 0 and +2 volts, where +2 volts is the maximum reading on the digital panel meter.

The TUNE voltage applied to amplifier A4 has a scale factor of 1V = 0.25 GHz. Amplifier A4, in conjunction with Zero Adjust R60 and 1.6 GHz Adjust R53, provides a low impedance to the Sample and Hold Circuits, and converts the scale factor to 1V = 1 GHz.

The YIG VOLTAGE applied to amplifier A3 has a scale factor of 1V = 4 GHz. Amplifier A3, in conjunction with 2 GHz Adjust R39 and 16 GHz Adjust R35, provides a low impedance to the Sample and Hold Circuits, and converts the scale factor to 1V = 10 GHz.

4-2.2.4 SAMPLE AND HOLD CIRCUITS. When the BAND 2 through 7 SAMPLE GATE goes high, Band 2 through 7 Sample and Hold switch Q10, Q11 is turned on, enabling the Band 2 through 7 Sample and Hold. The scaled voltage from signal conditioning amplifier A3 is applied through the Band 2 through 7 Sample and Hold, and is stored on capacitor C16.

When the BAND 1 SAMPLE GATE goes high, Band 1 Sample and Hold Switch Q8, Q9 is turned on, enabling the Band 1 Sample and Hold. The scaled voltage from signal conditioning amplifier A4 is applied through the Band 1 Sample and Hold, and is stored on capacitor C16.

The voltage on capacitor C16 is sampled periodically by digital panel meter M401, which digitizes the voltage for display in the FREQUENCY readout.

SECTION V

PERFORMANCE TESTS AND CALIBRATION

5-1. GENERAL

This section contains performance tests and calibration procedures for the Model 4745. Table 5-1 lists the test equipment required for performance testing and calibration.

5-2. PERFORMANCE TESTS

Perform the tests in the sequence listed.

5-2.1 BAND 1 LOW-PASS FILTER PERFORMANCE TEST (NOT APPLICABLE TO OPTION -01 and -03)

1. Select Band 1 on the tuning unit, and connect the Band 1 signal generator (2, table 5-1) to INPUT connector of Model 4745. Connect a cable from OUTPUT connector of Model 4745 to input of power meter (3, table 5-1).

2. Set signal generator for frequencies of 100 MHz, 900 MHz, and 1800 MHz. At each frequency, perform the following steps:

   a. Adjust signal generator output level for a power reading of 0 dBm.

   b. Disconnect power meter from OUTPUT connector, and disconnect signal generator from INPUT connector, without changing frequence or output level settings. Connect power meter to signal generator output, and record power reading. The power reading shall be less than -6 dBm.

5-2.2 BAND 2-5 TRACKING FILTER PERFORMANCE TEST (NOT APPLICABLE TO OPTION -03)

1. Connect Band 2 through 5 signal generator (4, table 5-1) to INPUT connector of Model 4745, and connect a cable from OUTPUT connector of Model 4745 to input of power meter (3, table 5-1).

2. Set signal generator for frequencies of 1.8 GHz (band 2), 3.0 GHz (band 2), 5.0 GHz (band 3), 7.0 GHz (band 4) and 10.0 GHz (band 5). For each frequency, perform the following steps:

   a. Select the appropriate band on the tuning unit.

   b. With FINE TUNE control on Model 4745 centered, adjust signal generator output level for approximately 0 dBm, and tune the tuning unit to obtain a peak power reading on the power meter.

   c. Operate the FINE TUNE control on the Model 4745 to obtain peak power reading on the power meter. Adjust signal generator output level for a power reading of -10 dBm on the power meter.

   d. Disconnect power meter from OUTPUT connector, and disconnect signal generator from INPUT connector, without changing frequency or output level settings.

TABLE 5-1. TEST EQUIPMENT REQUIRED

ITEM	DESCRIPTION	RECOMMENDED MANUFACTURER AND MODEL
1	Digital Voltmeter	Systron-Donner Model 7110
2	Band 1 Signal Generator	As Available
3	Power Meter	HP435A
4	Band 2 through 5 Signal Generator	As Available
5	KU Band Signal Generator	As Available
6	Comb Generator	AIL Tech 707-90

2. Connect power meter to signal generator output, and record power reading. The power reading shall be less than -3 dBm for 1.8 GHz, and shall be less than -2 dBm for the other frequencies.

5-2.3 BAND 6 TRACKING FILTER PERFORMANCE TEST (NOT APPLICABLE TO OPTION -03)

1. Connect KU band signal generator (5, table 5-1) to INPUT connector of Model 4745, and connect a cable from OUTPUT connector of Model 4745 to input of power meter (3, table 5-1).

2. Select Band 6, and set signal generator for frequencies of 13 GHz, 15 GHz, and 18 GHz.

   At each frequency, perform the following steps:

   a. With FINE TUNE control on Model 4745 centered, adjust signal generator output power level for approximately 0 dBm, and tune the tuning unit to obtain a peak power reading on the power meter.

   b. Operate the FINE TUNE control on the Model 4745 to obtain peak power reading on power meter. Adjust signal generator output level for a power reading of -10 dBm on the power meter.

   c. Disconnect power meter from OUTPUT connector, and disconnect signal generator from INPUT connector, without changing frequency or output level settings. Connect power meter to signal generator output, and record power reading. The power reading shall be less than 0 dBm.

5-2.4 DIGITAL FREQUENCY READOUT PERFORMANCE TEST (OPTIONS -03 AND -04 ONLY)

1. Set up the spectrum analyzer for a 3 msec/division free-running internal sweep, and a **spanwidth** of 100 MHz/division. Select Band 1 and AUTO bandwidth.

2. Connect comb generator (6, table 5-1)) to INPUT connector of Model 4745, and connect semi-rigid cable supplied with instrument from OUTPUT connector of Model 4745 to RF INPUT connector of tuning unit. Select 100 MHz comb.

3. Set FINE TUNE control on Model 4745 to the center of its range, and tune the tuning unit to center the 500 MHz comb line.

4. Momentarily set the span mode switch on the tuning unit to full span, and then switch back to off. This action minimizes hysteresis effects. Then, recenter the comb line.

NOTE

FREQUENCY meter accuracy ±.1%, ±1 digit.

5. Depress the START FREQ button on the Model 4745, the FREQUENCY readout shall indicate 0.000. Depress the STOP FREQ button on the Model 4745. The FREQUENCY readout shall indicate 1.000. Depress the CF or MARKER button on the Model 4745. The FREQUENCY readout shall indicate 0.500.

6. Select a 500 KHz/division spanwidth, and tune the tuning unit to center each of the comb lines listed below, and perform step 4 for each comb line. Then (except for the comb lines on band 1) operate the FINE TUNE control on the Model 4745 to obtain an optimum response. When tuned for optimum response, the CF OR MARKER, START FREQ, and STOP FREQ readouts shall be as listed below for each comb line.

NOTE

For CF OR MARKER readout, select 500 KHz/division spanwidth. For START FREQ and STOP FREQ readouts, select a 50 MHz/division spanwidth. Then, switch back to 500 KHz/division spanwidth to tune for the next frequency.

Band	Comb Line to be Centered (GHz)	500 KHZ/DIV SPANWIDTH CF OR MARKER Readout**	50 MHZ/DIV SPANWIDTH START FREQ Readout**	50 MHZ/DIV SPANWIDTH STOP FREQ Readout**
1	0.3	.300	.050	.550
1	0.9	.900	.650	1.150
1	1.8	1.800	1.550	over scale (blinking)
2	1.8	1.80	1.55	2.05
2	2.7	2.70	2.45	2.95
2	3.6	3.60	3.35	3.85
3	2.1	2.10	1.85	2.35
3	3.9	3.90	3.65	4.15
3	5.6	5.60	5.35	5.85
4	4.2	4.20	3.95	4.45
4	6.8	6.80	6.55	7.05
4	9.5	9.50	9.25	9.75
5	8.3	8.30	8.05	8.55
5	10.9	10.90	10.65	11.05
5	13.6	13.60	13.35	13.85
6*	10.3	10.30	10.05	10.55
6*	13.9	13.90	13.65	14.15
6*	17.5	17.50	17.25	17.25

*Connect KU band external waveguide mixer to OUTPUT connector of Model 4745, and connect output of external waveguide mixer to EXT MXR input of tuning unit.

**The reading accuracy is ±.190 ±1 digit.

5-2.5 DISPLAY CONTROL PERFORMANCE TEST (OPTIONS -03 AND -04 ONLY)

1. Set up the spectrum analyzer for a 3 msec/division free-running internal sweep and a **spanwidth** of 500 KHz/division. Select Band 1, and tune the tuning unit to 100 MHz.

2. Depress the CF or MARKER, START FREQ, and STOP FREQ buttons. The same FREQUENCY readout shall be produced in each Read Mode.

3. Switch to Bands 2, 3, 4, 5, 6, and 7. For each band, repeat step 2.

4. Switch to Band 8. The display shall be blanked.

5. Switch to Band 2, and set up the sweep control unit in the fast sweep mode (usec/division. Depress CF or MARKER button. A FREQUENCY readout shall be produced.

6. Depress the START FREQ and STOP FREQ buttons. The display shall be blanked in these read modes.

7. Set up the sweep control unit in the MARKER mode with a 3 msec/division sweep and position the marker spot to 3.0 GHz on the display. Depress the CF OR MARKER button. The FREQUENCY readout shall indicate the frequency of the marker spot. Depress the START FREQ and STOP FREQ buttons. The FREQUENCY readout shall indicate the start and stop frequencies.

8. On the sweep control unit, select the slow sweep (300 msec/division) mode. On the tuning unit, select the zero spanwidth mode. Depress the CF OR MARKER button. The FREQUENCY readout shall indicate the frequency to which the tuning unit is tuned.

9. Depress the START FREQ and STOP FREQ buttons. The FREQUENCY readouts shall be the same as the produced in step 8.

5-3. CALIBRATION

For a complete calibration of the Model 4745, perform the procedures that follow in the sequence given.

5-3.1 TRACKING FILTER CALIBRATION (NOT APPLICABLE TO OPTION -03)

NOTE
See figure 5-1 for location of adjustments.

To calibrate the tracking filter, proceed as follows:

1. Connect the supplied semi-rigid coaxial cable from the OUTPUT connector of the Model 4745 to the rf input connector of the tuning unit.

2. Connect the digital voltmeter (1, table 5-1) between test point TP4 and ground, and adjust -10V adjust R44 of the Model 4745 for a reading of -10 ±0.1 volts.

3. Set up the sweep control unit for a 3 msec/division, free-running internal sweep.

4. Set up the tuning unit for a 500 KHz/division spanwidth, and a bandwidth of 100 KHz. Set in 30 dB of RF attenuation and 20 dB of IF attenuation. Select a logarithmic display with video filtering off, full span on, and frequency stabilization off. Select Band 1, and center the FINE TUNE control.

5. On the Model 4745, center the FINE TUNE control, and adjust Fast Adjust R97 fully counterclockwise. If the digital frequency readout is included, press the CF OR MARKER button.

6. Connect the comb generator (6, table 5-1) to the INPUT connector of the Model 4745, and set up for a 100-MHz comb. If the Low-Pass Filter is included, proceed to step 7. If the Low-Pass Filter is not included, proceed to step 8.

7. Observe 19 combs, with the 19th comb attenuated 10 to 20 dB.

8. Set full span to off, and tune the tuning unit to center the zero marker.

9. Momentarily set the span mode switch on the tuning unit to full span, and then switch back to off. This action minimizes hysteresis effects.

10. Recenter the zero marker, and connect the digital voltmeter to test point TP1. Adjust Zero Adjust R33 of the Model 4745 for 0.000 volts.

11. On the tuning unit, select Band 5, set in 10 dB of RF attenuation, and select the 1-MHz bandwidth. Set span mode to full span.

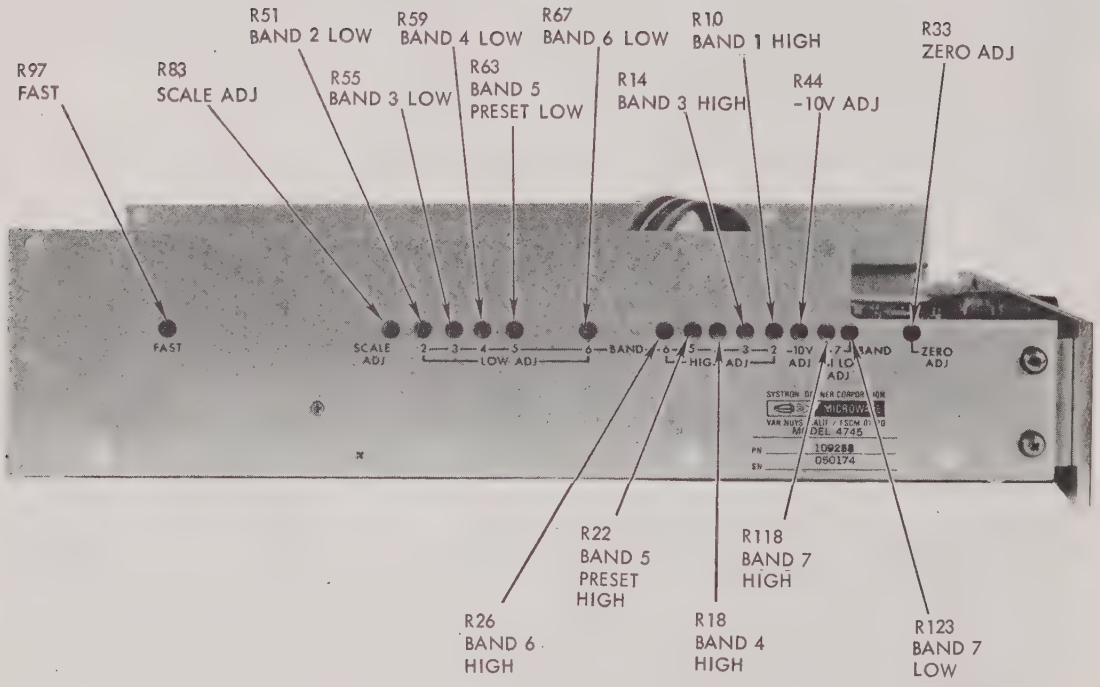


Figure 5-1. Preselector Control Adjustments

12. On the sweep control unit, select a 30 msec/division sweep, and adjust Scale Adjust R83 of the Model 4745 to obtain a comb at the right side of the display.

13. Adjust the Band Preset-Low potentiometer R63 to obtain a comb at the left side of the screen, then readjust the scale R83 and Band 5 Preset-Low (R63) potentiometers to obtain combs across the entire display.

14. Momentarily set the span mode switch to full scan, and then switch back to off. This action minimizes hysteresis effects. Rock the FINE TUNE control and adjust the Band 5 Preset-Low potentiometer R63 so that the comb line (8.5 GHz) at the low end of the band is attenuated by an equal amount when the FINE TUNE control is fully clockwise and fully counter-clockwise (the signal peak should occur when the FINE TUNE control is centered).

15. Rock the FINE TUNE control and adjust the Band 5 High potentiometer R22 so that the comb line 13.0 GHz at the high end of the band is attenuated by an equal amount when the FINE TUNE control is fully clockwise and fully counter-clockwise (the signal peak should occur when the FINE TUNE control is centered). Adjusting R22 should not affect the low end, however the low adjustment R63 does affect the high end.

16. Repeat steps 14 and 15, readjusting as necessary.

17. Set the sweep to 3 msec/division, and observe the change in comb amplitude. Turn Fast Adjust R97 fully clockwise, then turn slowly counterclockwise for best comb amplitude across the band. Allow for over-resolving at the 3 msec sweep rate.

18. Repeat steps 14 through 16 for bands 2, 3, 4, 6 and 7 without readjusting the Scale R83 or Fast R97 adjustments. The high and low end comb lines, the high and low potentiometers, and the RF attenuator settings are as follows:

	Comb Line (GHz)		Potentiometers		
Band	Low	High	Low	High	RF Attenuator Setting
2	2.0	3.8	R51	R10	30 dB
3	2.1	5.5	R55	R14	20 dB
4	4.2	9.2	R59	R18	10 dB
6*	11.0	17.5	R67	R26	Not Applicable
7*	14.5	18.0	R123	R118	Not Applicable

*Requires use of a KU Band external mixer (responses from 12.4 GHz to 18 GHz)

5-3.2 DIGITAL FREQUENCY READOUT CALIBRATION (OPTIONS -03 AND -04 ONLY)

NOTE

See figure 5-2 for location of adjustments.

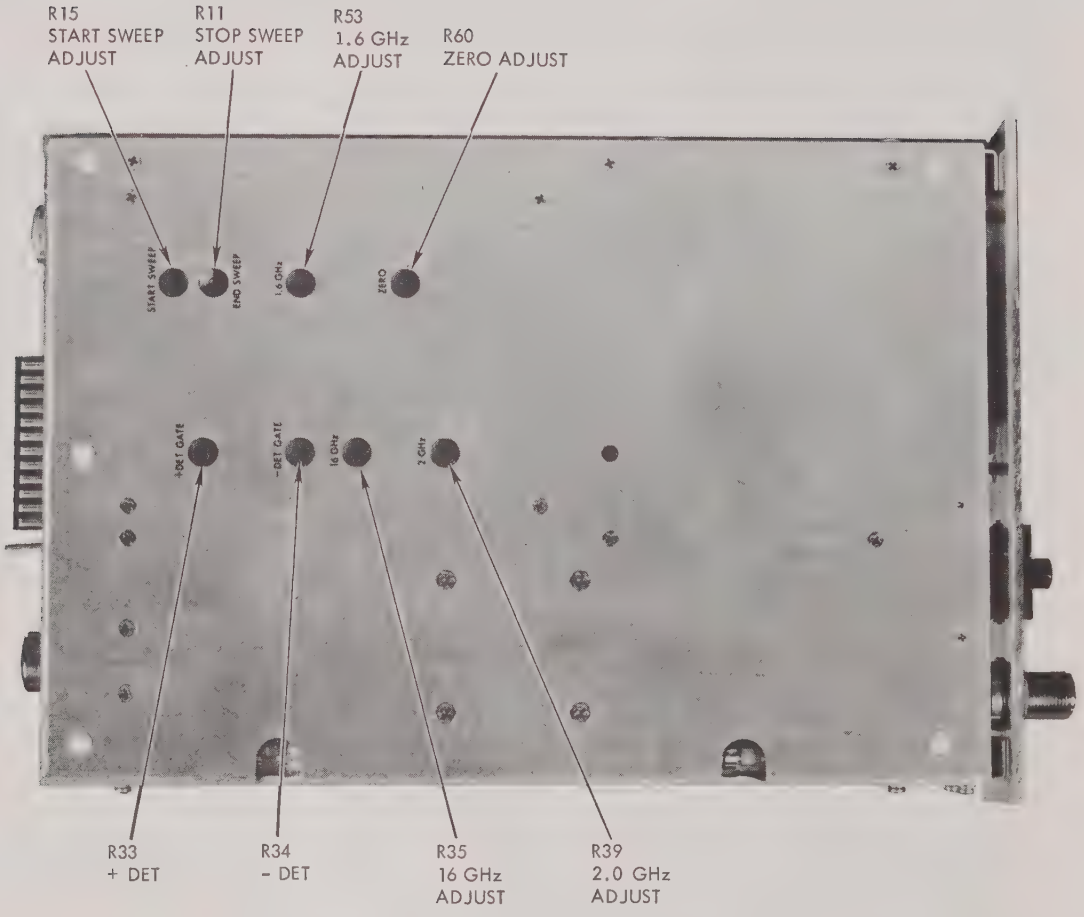


Figure 5-2. Meter Interface Adjustments

For option -04, this procedure should be performed only after completion of the Tracking Filter Calibration in paragraph 5-3.1.

1. Connect the semi-rigid coaxial cable from the OUTPUT connector of the Model 4745 to the rf input connector of the tuning unit.

2. Set up the sweep control unit for a 3 msec/division, free-running, internal sweep.

3. Set up the tuning unit for a 500 KHz/division **spanwidth**, and a bandwidth of 100 KHz. Set in 30 dB of RF attenuation and 20 dB of IF attenuation. Select a logarithmic display with video filtering off, full span on, and frequency stabilization off. Select Band 1, and center the FINE TUNE control.

4. On the Model 4745, center the FINE TUNE control, and press the CF OR MARKER button.

5. Connect the comb generator (6, table 5-1) to the INPUT connector of the Model 4745, and set up for a 100 MHz comb.

6. Tune the tuning unit to center the zero marker.

7. Momentarily set the span mode switch on the tuning unit to full **span**, and then switch back to off. This action minimizes hysteresis effects.

8. Recenter the zero marker, and adjust Zero Adjust R60 for a FREQUENCY reading of 0.000.

9. Center the 1.6 GHz comb line, perform step 7, and recenter if necessary. Then, adjust 1.6 GHz adjust R53 for a FREQUENCY reading of 1.600.

10. Repeat steps 6 through 9, readjusting as necessary.

11. Select Band 3, center the zero marker, perform step 7, and recenter as required. Adjust 2.0 GHz adjust R39 for a FREQUENCY reading of 2.05.

12. Select Band 7, center the zero marker, perform step 7, and recenter as required. Adjust 16 GHz adjust R35 for a FREQUENCY reading of 14.35.

13. Repeat steps 11 and 12, readjusting as necessary.

14. On the tuning unit, select band 1 and a 100 MHz/division spanwidth.

15. On the display, adjust horizontal positioning, as required, to center the horizontal trace in the graticule.

16. Tune the tuning unit so that the zero marker is 1 division in from the left side of the screen, and depress the START FREQ button. Adjust Start Sweep Adjust R15 for a FREQUENCY reading of -0.100.

17. Press the STOP FREQ button, and adjust Stop Sweep Adjust R11 for a FREQUENCY reading of +0.900.

18. Press the CF OR MARKER button. On the tuning unit, select a spanwidth of 500 KHz/division, and tune so that a FREQUENCY reading of 1.000 is obtained.

19. On the tuning unit, select a spanwidth of 200 MHz/division. The FREQUENCY reading should not change from 1.000. If the reading changes, proceed to step 20.

20. With the spanwidth set to 200 MHz/division, adjust the +Det R33 and -Det R34 adjustments to shift the FREQUENCY reading one or two digits towards the correct reading of 1.000. Alternate between adjusting R33 and R34, being sure that, each time, the FREQUENCY reading is shifted by the same number of digits for both adjustments. Adherence to this procedure is critical, since, if R33 and R34 are adjusted different amounts, the width of the sampling pulse will be altered. At completion, the width of the sampling pulse (as observed at TP6 or PCB402) should be approximately 300 usec (with sweep rate set to 3 msec/division).

SECTION VI
TROUBLESHOOTING

6-1. GENERAL

Table 6-1 lists symptoms of malfunction noted during performance testing and calibration, indicates the probable cause(s), and the recommended remedial action.

NOTE

Use figures 4-1 and 4-2 for trouble-shooting analysis

TABLE 6-1. TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
No output on Bands 1 through 7.	Coaxial switch S401 or S402	Replace
No output on Band 1. Bands 2 through 7 are normal.	Low-Pass Filter FL401	Replace
	Coaxial Switch S401 or S402	Replace
	3 dB pad AT401	Replace
No output on Bands 2 through 7. Band 1 is normal.	Tracking Filter Y401	Replace
	Coaxial Switch S401 or S402	Replace
	Driver Q401	Replace
	PCB401	Replace
No Digital Frequency Readout.	VR401	Replace
	PCB402	Replace
	M401	Replace
Excessive insertion loss on Band 1.	Low-Pass Filter FL401	Replace
Excessive insertion loss on Bands 2 through 7 (all bands abnormal)	Tracking Filter Y401	Replace
	Driver Q401	Replace
	PCB401	Replace

TABLE 6-1. TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive insertion loss on a single band (BAND 2, 3, 4, 5, 6, or 7)	Calibration is incorrect	Replace
	PCB401	Replace
Tracking filter calibration cannot be performed satisfactorily.	PCB401	Replace
	Tracking Filter Y401	Replace
	Driver Q401	Replace
Digital frequency CF OR MARKER readout is normal when operating in slow sweep (300 msec/div.), fast sweep (usec/div.), and marker modes, but is abnormal in all other modes.	Detector Gate Adjustment is incorrect	Perform Detector Gate Adjustment
	PCB401	Replace
Digital frequency readouts for CF OR MARKER, START FREQ, and STOP FREQ are abnormal for all bands in all modes of operation.	M401	Replace
	PCB401	Replace
Digital frequency readouts are normal on Band 1, but are abnormal on Bands 2 through 7.	Band 2 through 7 meter calibration is incorrect	Perform calibration
	PCB401	Replace
Digital frequency readouts are normal on Bands 2 through 7, but are abnormal on Band 1.	Band 1 meter calibration is incorrect.	Perform calibration
	PCB401	Replace
Digital frequency OR MARKER readouts are abnormal when operating in slow sweep (300 msec/div.), fast sweep (usec/div.), and marker modes, but are normal in all other modes.	PCB401	Replace
Display is always blanked	PCB401	Replace
	M401	Replace
Display is not blanked on Band 8.	PCB401	Replace
	M401	Replace

TABLE 6-1. TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Digital frequency readouts for VF OR MARKER and START FREQ read modes are normal, but STOP FREQ readings are abnormal.	Stop Sweep Adjustment is incorrect	Perform Stop Sweep Adjustment
	PCB401	Replace
Digital frequency readouts for CF OR MARKER and STOP FREQ read modes are normal, but START FREQ readings are abnormal.	Start Sweep Adjustment is incorrect	Perform Start Sweep Adjustment
	PCB401	Replace

SECTION VII
REPLACEABLE PARTS LIST

7-1. INTRODUCTION

This section lists replaceable parts for the Model 4745 Tracking Preselector.

7-2. EXPLANATION OF COLUMNS

FIGURE NO. This column references the figure number in which the part can be located.

REFERENCE DESIGNATION. Parts are listed in sequence by reference designation and may be located on the schematic diagram or other referenced figure by this designator.

PART NUMBERS. Standard parts are identified by both a Systron-Donner and the standard part number. Non-standard parts not manufactured or controlled by Systron-Donner are identified by both a Systron-Donner and the manufacturer's part number.

MFR. The five-digit federal manufacturers code, as listed in Cataloging Handbooks H4-1 and H4-2, are listed in this column. These codes and corresponding manufacturers are listed following paragraph 7-3.

DESCRIPTION. Descriptions of component parts of PCB401 and PCB402 are indented to indicate the parts comprising each board assembly. Parenthetical notes are included to indicate parts not common to all models.

7-3. MANUFACTURERS' CODES

CODE	NAME
01121	Allen-Bradley Co. Milwaukee, Wis. 53204
02660	Amphenol Corp. Broadview, Il. 60153
02799	Arco Capacitors, Inc. Los Angeles, Ca.
07263	Fairchild Camera and Instrument Corp. Semiconductor Division Mountain View, Ca.
09969	Dale Electronics Inc. Yankton, So. Dakota 57078
12040	National Semiconductor Corp. Danbury, Conn. 06810
13623	EMC Corp. St. Paul, Minn. 55101

CODE	NAME
15003	Valor Electronics, Inc. Gardena, Ca. 90249
21317	Electronic Applications Co. El Monte, Ca. 90270
33809	Texas Instruments Inc. Dallas, Tx. 75222
49675	RCA Corporation Camden, NJ 09102
49956	Raytheon Co. Lexington, Ma. 02173
56289	Sprague Electric Co. North Adams, Mass. 01247
71450	CTS Corp. Elkhart, Ind. 46514
72982	Erie Technological Products Inc. Erie, Pa. 16512
73138	Beckman Instruments Inc. Helipot Division Fullerton, Ca. 92634
88245	Litton Precision Products Inc. Van Nuys, Ca. 91409

REPLACEABLE PARTS LIST

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR	DESCRIPTION	QTY
8-1	AT401	107200	4403	13623	ATTENUATOR - PAD, 3 dB	1
	C401	107166	DM15-102J	02799	CAPACITOR, 1000 pf, 1%	1
	C402	107039	8131-100-651-104M	72982	CAPACITOR, .1 uf	1
	CR401, CR402	107120	1N914		DIODE	2
	E401, E402	107063	4552A-4-11.2	88245	STANDOFF - INSUL.	2
	FL401	109152			FILTER - LOW PASS	1
	M401	109274			METER (NOT USED ON MODEL 4745)	1
	P401	107094	26-159-24	02660	CONNECTOR - 24 PIN - MALE	1
8-2	PCB401	10925901			BOARD ASSY - PRESELECTOR Consisting of:	1
	PCB401A1 thru A5	107168	LM748CN	12040	OPERATIONAL AMPLIFIER, uA748	5
	PCB401C1	100063	150D106X9020B2	56289	CAPACITOR, 10 uf, 20V	1
	PCB401C2	107174	DM5-330J	02799	CAPACITOR, 33 pf, 300V	1
	PCB401C3	100063	150D106X9020B2	56289	CAPACITOR, 10 uf, 20V	1
	PCB401C4, C5	100182	150D685X9035B2	56289	CAPACITOR, 6.8 uf, 35V	2
	PCB401C6, C7	100063	150D106X9020B2	56289	CAPACITOR, 10 uf, 20V	2
	PCB401C8 thru C13	107038	8121-100-651-103M	72982	CAPACITOR, .01 uf, 100V	6
	PCB401C14	100063	150D106X9020B2	56289	CAPACITOR, 10 uf, 20V	1
	PCB401C15	107174	DM5-330J	02799	CAPACITOR, 33 pf, 300V	1
	PCB401C16	107038	8121-100-651-103M	72982	CAPACITOR, .01 uf, 100V	1
	PCB401C17	107173	DM5-100J	02799	CAPACITOR, 10 pf, 300V	1
	PCB401C18, C19	100063	150D106X9020B2	56289	CAPACITOR, 10 uf, 20V	2
	PCB401C20	107295	8131-100-651-334M	72982	CAPACITOR, .33 uf, 100V	1
	PCB401C21	107173	DM5-100J	02799	CAPACITOR, 10 pf, 300V	1
	PCB401C22, C23	100063	150D106X9020B2	56289	CAPACITOR, 10 uf, 20V	2
	PCB401C24	107039	8131-100-651-104M	72982	CAPACITOR, .1 uf, 100V	1
	PCB401C26	100063	150D106X9020B2	56289	CAPACITOR, 10 uf, 20V	1
	PCB401C27	107174	DM5-330J	02799	CAPACITOR, 33 pf, 300V	1
	PCB401C28	100063	150D106X9020B2	56289	CAPACITOR, 10 uf, 20V	1
	PCB401C29	107038	8121-100-651-103M	72982	CAPACITOR, .01 uf, 100V	1
	PCB401CR1 thru CR5	107042	1N914		DIODE	5
	PCB401CR6	100386	1N827		DIODE, ZENER	1
	PCB401CR7, CR8	107042	1N914		DIODE	2
	PCB401CR12	107220	1N5373		DIODE, ZENER	1
	PCB401CR13	100450	1N4933		DIODE, ZENER	1
	PCB401CR14 thru CR28	107042	1N914		DIODE	15
	PCB401IC1	107055	RC4195DN	49956	REGULATOR, ±15V	1
	PCB401K1	107170	1C5AH	21317	RELAY, SPDT	1
	PCB401K2 thru K7	107169	RA30382121		RELAY, DPST	6
	PCB401Q1, Q2	101378	2N3906		TRANSISTOR	2
	PCB401Q3	101369	2N3646		TRANSISTOR	1
	PCB401Q4	101405	2N5193		TRANSISTOR	1
	PCB401R1	107195	203A 21K 1% 10PPM	15003	RESISTOR, 21K, 1%	1
	PCB401R2	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	1
	PCB401R3, R4	107191	203A 10K 1% 10PPM	15003	RESISTOR, 10K, 1%	2
	PCB401R5	107193	203A 17K 1% 10PPM	15003	RESISTOR, 17K, 1%	1
	PCB401R6, R7	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	2
	PCB401R8, R9	101667	RC20GF221J		RESISTOR, 220 OHMS, 1/2W, 5%	2
	PCB401R10	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R11	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1

REPLACEABLE PARTS LIST

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR	DESCRIPTION	QTY
8-2	PCB401R12	107193	203A 17K 1% 10PPM	15003	RESISTOR, 17K, 1%	1
	PCB401R13	107184	203A 3K 1% 10PPM	15003	RESISTOR, 3K, 1%	1
	PCB401R14	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R15	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R16	107501	203A 14K 1% 10PPM	15003	RESISTOR, 14K, 1%	1
	PCB401R17	107187	203A 6K 1% 10PPM	15003	RESISTOR, 6K, 1%	1
	PCB401R18	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R19	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R20	107190	203A 8.8K 1% 10PPM	15003	RESISTOR, 8.8K, 1%	1
	PCB401R21	107188	203A 8K 1% 10PPM	15003	RESISTOR, 8K, 1%	1
	PCB401R22	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R23	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R24	107190	203A 8.8K 1% 10PPM	15003	RESISTOR, 8.8K, 1%	1
	PCB401R25	107188	203A 8K 1% 10PPM	15003	RESISTOR, 8K, 1%	1
	PCB401R26	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R27	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R28	107188	203A 8K 1% 10PPM	15003	RESISTOR, 8K, 1%	1
	PCB401R29	107192	203A 15K 1% 10PPM	15003	RESISTOR, 15K, 1%	1
	PCB401R30	107195	203A 21K 1% 10PPM	15003	RESISTOR, 21K, 1%	1
	PCB401R31	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R32	107185	203A-4K 1% 10PPM	15003	RESISTOR, 4K, 1%	1
	PCB401R33	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R34	107193	203A 17K 1% 10PPM	15003	RESISTOR, 17K, 1%	1
	PCB401R35	101598	RC07GF472J		RESISTOR, 4.7K, 1/4W, 5%	1
	PCB401R36	101562	RC07GF222J		RESISTOR, 2.2K, 1/4W, 5%	1
	PCB401R37	101598	RC07GF472J		RESISTOR, 4.7K, 1/4W, 5%	1
	PCB401R39	101598	RC07GF472J		RESISTOR, 4.7K, 1/4W, 5%	1
	PCB401R41	101598	RC07GF472J		RESISTOR, 4.7K, 1/4W, 5%	1
	PCB401R42	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	1
	PCB401R43	101598	RC07GF472J		RESISTOR, 4.7K, 1/4W, 5%	1
	PCB401R44	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R45	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R46	107179	RN55D4991F		RESISTOR, MF, 4.99K, 1/8W, 1%	1
	PCB401R47	107177	RN55D1151F		RESISTOR, MF, 1.15K, 1/8W, 1%	1
	PCB401R48	107191	203A 10K 1% 10PPM	15003	RESISTOR, 10K, 1%	1
	PCB401R49, R50	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	2
	PCB401R51	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R52	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	1
	PCB401R53	107197	203A 60K 1% 10PPM	15003	RESISTOR, 60K, 1%	1
	PCB401R54	107181	203A 2K 1% 10PPM	15003	RESISTOR, 2K, 1%	1
	PCB401R55	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R56	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	1
	PCB401R57	107196	203A 50K 1% 10PPM	15003	RESISTOR, 50K, 1%	1
	PCB401R58	107181	203A 2K 1% 10PPM	15003	RESISTOR, 2K, 1%	1
	PCB401R59	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R60	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	1
	PCB401R61	107194	203 20K 1% 10PPM	15003	RESISTOR, 20K, 1%	1

REPLACEABLE PARTS LIST

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR	DESCRIPTION	QTY
8-2	PCB401R62	107181	203A 2K 1% 10PPM	15003	RESISTOR, 2K, 1%	1
	PCB401R63	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R64	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	1
	PCB401R65	107191	203A 10K 1% 10PPM	15003	RESISTOR, 10K, 1%	1
	PCB401R66	107182	203A 238K 1% 10PPM	15003	RESISTOR, 2.38K, 1%	1
	PCB401R67	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R68	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	1
	PCB401R69	107188	203A 8K 1% 10PPM	15003	RESISTOR, 8K, 1%	1
	PCB401R70	107183	203A 2.65K 1% 10PPM	15003	RESISTOR, 2.65K, 1%	1
	PCB401R71	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R72	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	1
	PCB401R73	107023	RN55D3013F		RESISTOR, MF, 301K, 1/8W, 1%	1
	PCB401R74	107194	203 20K 1% 10PPM	15003	RESISTOR, 20K, 1%	1
	PCB401R76	101569	203A 5K 1% 10PPM	15003	RESISTOR, 5K, 1%	1
	PCB401R77	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	1
	PCB401R78	107026	RN55D5110F		RESISTOR, MF, 511 OHMS	1
	PCB401R79	107188	203A 8K 1% 10PPM	15003	RESISTOR, 8K, 1%	1
	PCB401R80	101569	RC07GF102J		RESISTOR, 1K, 1/4W, 5%	1
	PCB401R81	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	1
	PCB401R82	101569	RC07GF102J		RESISTOR, 1K, 1/4W, 5%	1
	PCB401R83	107176	89WR20K	73138	POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R84	107022	RN55D3012F		RESISTOR, MF, 30.1K, 1/8W, 1%	1
	PCB401R85	107185	203A 4K 1% 10PPM	15003	RESISTOR, 4K, 1%	1
	PCB401R86	107195	203A 21K 1% 10PPM	15003	RESISTOR, 21K, 1%	1
	PCB401R87, R88	101562	RC07GF222J		RESISTOR, 2.2K, 1/4W, 5%	2
	PCB401R89, R90	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	2
	PCB401R91	101566	RC07GF221J		RESISTOR, 220 OHMS, 1/4W, 5%	1
	PCB401R92	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	1
	PCB401R93	101569	RC07GF102J		RESISTOR, 1K, 1/4W, 5%	1
	PCB401R94	101864	RC32GF471J		RESISTOR, 470 OHMS, 1W, 5%	1
	PCB401R95	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	1
	PCB401R96	107195	203A 21K 1% 10PPM	15003	RESISTOR, 21K, 1%	1
	PCB401R97	107175	362S102B	71450	POTENTIOMETER, PC, 1K, 1/2W, 20%	1
	PCB401R98, R99	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	2
	PCB401R100	101569	RC07GF102J		RESISTOR, 1K, 1/4W, 5%	1
	PCB401R101	101609	RC07GF101J		RESISTOR, 100 OHMS, 1/4W, 5%	1
	PCB401R102	101544	RC07GF682J		RESISTOR, 6.8K, 1/4W, 5%	1
	PCB401R103, R104	101562	RC07GF222J		RESISTOR, 2.2K, 1/4W, 5%	2
	PCB401R105	101544	RC07GF682J		RESISTOR, 6.8K, 1/4W, 5%	1
	PCB401R106, R107	101562	RC07GF222J		RESISTOR, 2.2K, 1/4W, 5%	2
	PCB401R117	107178	RN55D2003F		RESISTOR, MF, 200K, 1/8W, 1%	1
	PCB401R118	107176	89WR20K		POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R119	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R120	107185	203A 4K 1% 10PPM	15003	RESISTOR, 4K, 1%	1
	PCB401R122	101598	RC07GF472J		RESISTOR, 4.7K, 1/4W, 5%	1
	PCB401R123	107176	89WR20K		POTENTIOMETER, PC, 20K, 1W, 10%	1
	PCB401R124	107180	RN55D4992F		RESISTOR, MF, 49.9K, 1/8W, 1%	1
	PCB401R125	107187	203A 6K 1% 10PPM	15003	RESISTOR, 6K, 1%	1

REPLACEABLE PARTS LIST

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR	DESCRIPTION	QTY
8-2	PCB401R126	107184	203A 3K 1% 10PPM	15003	RESISTOR, 3K, 1%	1
	PCB401R127	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	1
8-3	PCB402	10926001			BOARD ASSY - METER INTERFACE (NOT USED ON MODEL 4745) Consisting of:	1
	PCB402A1 thru PCB402A4	107168	LM748CN	12040	OPERATIONAL AMPLIFIER uA748	4
	PCB402C1	107208	8121-100-W5R0-102K	72982	CAPACITOR, .001 uf	1
	PCB402C2 thru C4	107039	8131-100-651 104M	72982	CAPACITOR, .1 uf	3
	PCB402C5	107208	8121-100-W5R0-102K	72982	CAPACITOR, .001 uf	1
	PCB402C6 thru C8	107039	8131-100-651-104M	72982	CAPACITOR, .1 uf	3
	PCB402C9	100314	DM10-330J	02799	CAPACITOR, 33 pf	1
	PCB402C10	107039	8131-100-651-104M	72982	CAPACITOR, .1 uf	1
	PCB402C11	100314	DM10-330J	02799	CAPACITOR, 33 pf	1
	PCB402C12 thru C16	107039	8131-100-651-104M	72982	CAPACITOR, .1 uf	5
	PCB402C17	100203	150D225X9020A2	56289	CAPACITOR, 2.2 uf	1
	PCB402C19 thru C22	107041	196D106X9020JA1	56289	CAPACITOR, 10 uf	4
	PCB402CR1 thru CR7	107120	1N914		DIODE	7
	PCB402IC1 thru IC5	025796	SN74L00N	33809	GATE, QUAD NAND	5
	PCB402IC6	107212	CD4016AE	49675	INTEGRATED CKT	1
	PCB402L1	107209	9240-732		INDUCTOR, 100 uh	1
	PCB402Q1	101378	2N3906		TRANSISTOR	1
	PCB402Q2	101369	2N3646		TRANSISTOR	1
	PCB402Q3	101378	2N3906		TRANSISTOR	1
	PCB402Q4 thru Q8	101369	2N3646		TRANSISTOR	5
	PCB402Q9	101378	2N3906		TRANSISTOR	1
	PCB402Q10	101369	2N3646		TRANSISTOR	1
	PCB402Q11	101378	2N3906		TRANSISTOR	1
	PCB402Q12	101369	2N3646		TRANSISTOR	1
	PCB402Q13	101385	2N4871		TRANSISTOR	1
	PCB402Q14	101369	2N3646		TRANSISTOR	1
	PCB402R1	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	1
	PCB402R2	101792	RC05GF472J		RESISTOR, 4.7K, 1/8W, 5%	1
	PCB402R3 thru R5	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	3
	PCB402R6	101792	RC05GF472J		RESISTOR, 4.7K, 1/8W, 5%	1
	PCB402R7	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	1
	PCB402R8	101792	RC05GF472J		RESISTOR, 4.7K, 1/8W, 5%	1
	PCB402R9	101697	RC05GF103J		RESISTOR, 10K, 1/8W, 5%	1
	PCB402R10	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	1
	PCB402R11	107205	72PMR20K	73138	POTENTIOMETER, 20K	1
	PCB402R12	101697	RC05GF103J		RESISTOR, 10K, 1/8W, 5%	1
	PCB402R13	101792	RC05GF472J		RESISTOR, 4.7K, 1/8W, 5%	1
	PCB402R14	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	1
	PCB402R15	107205	72PMR20K	73138	POTENTIOMETER, 20K	1
	PCB402R16	107021	RN55D3011F		RESISTOR, MF, 3.01K, 1/8W, 1%	1
	PCB402R17, R18	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	2
	PCB402R19	101701	RC05GF101J		RESISTOR, 100 OHMS, 1/8W, 5%	1
	PCB402R20	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	1
	PCB402R21	101701	RC05GF101J		RESISTOR, 100 OHMS, 1/8W, 5%	1
	PCB402R22, R23	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	2
	PCB402R24	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	1

REPLACEABLE PARTS LIST

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR	DESCRIPTION	QTY
8-3	PCB402R25	101701	RC05GF101J		RESISTOR, 100 OHMS, 1/8W, 1%	1
	PCB402R26, R27	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	2
	PCB402R28	101701	RC05GF101J		RESISTOR, 100 OHMS, 1/8W, 1%	1
	PCB402R29, R30	101713	RC05GF332J		RESISTOR, 3.3K, 1/8W, 5%	2
	PCB402R31, R32	107018	RN55D1003F		RESISTOR, MF, 100K, 1/8W, 1%	2
	PCB402R33, R34, R35	107205	72PMR20K	73138	POTENTIOMETER, 20K	3
	PCB402R36	107180	RN55D4992F		RESISTOR, 49.9K, 1/8W, 1%	1
	PCB402R37	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	1
	PCB402R38	107207	RN55D4321F		RESISTOR, MF, 4.32K, 1/8W, 1%	1
	PCB402R39	107205	72PMR20K	73138	POTENTIOMETER, 20K	1
	PCB402R40	107023	RN55D3013F		RESISTOR, MF, 301K, 1/8W, 1%	1
	PCB402R41	101713	RC05GF332J		RESISTOR, 3.3K, 1/8W, 5%	1
	PCB402R42	101701	RC05GF101J		RESISTOR, 100 OHMS, 1/8W, 5%	1
	PCB402R43	101798	RC05GF221J		RESISTOR, 220 OHMS, 1/8W, 5%	1
	PCB402R44	101701	RC05GF101J		RESISTOR, 100 OHMS, 1/8W, 5%	1
	PCB402R45	107471	RN55D3321F		RESISTOR, 3.32K, 1/8W, 1%	1
	PCB402R46	101698	RC05GF153J		RESISTOR, 15K, 1/8W, 5%	1
	PCB402R47	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	1
	PCB402R48	101792	RC05GF472J		RESISTOR, 4.7K, 1/8W, 5%	1
	PCB402R49	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	1
	PCB402R50	101711	RC05GF102J		RESISTOR, 1K, 1/8W, 5%	1
	PCB402R51	101799	RC05GF822J		RESISTOR, 8.2K, 1/8W, 5%	1
	PCB402R52	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	1
	PCB402R53	107205	72PMR20K	73138	POTENTIOMETER, 20K	1
	PCB402R54	107017	RN55D1002F		RESISTOR, MF, 10K, 1/8W, 1%	1
	PCB402R55	107180	RN55D4992F		RESISTOR, MF 49.9K, 1/8W, 1%	1
	PCB402R56	101701	RC05GF101J		RESISTOR, 100 OHMS, 1/8W, 5%	1
	PCB402R57	107021	RN55D3011F		RESISTOR, 3.01K, 1/8W, 1%	1
	PCB402R58	101798	RC05GF221J		RESISTOR, 220 OHMS, 1/8W, 5%	1
	PCB402R59	101701	RC05GF101J		RESISTOR, 100 OHMS, 1/8W, 5%	1
	PCB402R60	107205	72PMR20K	73138	POTENTIOMETER, 20K	1
	PCB402R61	107023	RN55D3013F		RESISTOR, MF, 301K, 1/8W, 1%	1
	PCB402R62	107471	RN55D3321F		RESISTOR, 3.32K, 1/8W, 1%	1
	PCB402R63 thru R67	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	5
	PCB402R68	101792	RC05GF472J		RESISTOR, 4.7K, 1/8W, 5%	1
	PCB402R69	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	1
	PCB402R70	101697	RC05GF103J		RESISTOR, 10K, 1/8W, 5%	1
	PCB402R71, R72, R73	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	3
	PCB402R74	101792	RC05GF472J		RESISTOR, 4.7K, 1/8W, 5%	1
	PCB402R75	101697	RC05GF103J		RESISTOR, 10K, 1/8W, 5%	1
	PCB402R76	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	1
	PCB402R77	101709	RC05GF471J		RESISTOR, 470 OHMS, 1/8W, 5%	1
	PCB402R78	101955	RC05GF474		RESISTOR, 470K, 1/8W, 5%	1
	PCB402R79	101709	RC05GF471J		RESISTOR, 470 OHMS, 1/8W, 5%	1
	PCB402R80 thru R84	101719	RC05GF222J		RESISTOR, 2.2K, 1/8W, 5%	5
	PCB402R85	101711	RC05GF102J		RESISTOR, 1K, 1/8W, 5%	1
	PCB402R86, R87	101551	RC20GF181J		RESISTOR, 180 OHMS, 1/2W, 5%	2
	PCB402VR1	107500	RC4195T	49956	VOLTAGE REGULATOR	1
8-1	Q401	107160	2N4347		TRANSISTOR	1
	R401	107165	RH5-5 OHMS-10PPM	09969	RESISTOR, 5 OHMS, 5W, 1% 10PPM	1
	R402	107162	WA2G040P503UA	01121	RESISTOR - VARIABLE - FINE TUNE 50K	1
	R403	101498	RC20GF101J		RESISTOR, 100 OHMS, 1/2W	1
	R404	107159	239E1R05	56289	RESISTOR, 1 OHM, 2W	1
	R405	101569	RC70GF102J		RESISTOR, 1K, 1/4W, 5%	1
	S401, S402	109153			COAX SWITCH	2

REPLACEABLE PARTS LIST

FIG. NO.	REFERENCE DESIGNATION	SYSTRON-DONNER PART NUMBER	MFR'S PART NUMBER	MFR	DESCRIPTION	QTY
8-1	S403, S404, S405	109036			SWITCH, (NOT USED ON MODEL 4745)	3
	VR401	107199	7805KCT03	07263	VOLTAGE REGULATOR (NOT USED ON MODEL 4745)	1
	Y401	*109151			FILTER - YIG TUNED	1
		*109308				
		107049	C821650	33809	I/C SOCKET, 16 PIN (MODEL 4745-04 ONLY)	1
		109252			CABLE ASSY - RF OUT	1
		109253			CABLE ASSY - YIG IN & OUT	2
		109254			CABLE ASSY - RF IN	1
		109255			CABLE ASSY - RF INTERCONNECT	1
		109165			CABLE ASSY - PRESELECTOR TO PLUG-IN	1
		109037			CABLE ASSY - PRESELECTOR TO METER INTERFACE BOARD (NOT USED ON MODEL 4745)	1
		107102	IRQ-5001	21604	KNOB, (BLACK WITH INDICATOR)	1

*Alternate parts

SECTION VIII

CIRCUIT DIAGRAMS

This section contains the following diagrams:

Figure	Title	Page
8-1	Tracking Preselector Schematic Diagram	8-3
8-2	Preselector Control Board PCB401, Schematic Diagram	8-5
8-3	Meter Interface Board PCB402, Schematic Diagram	8-7

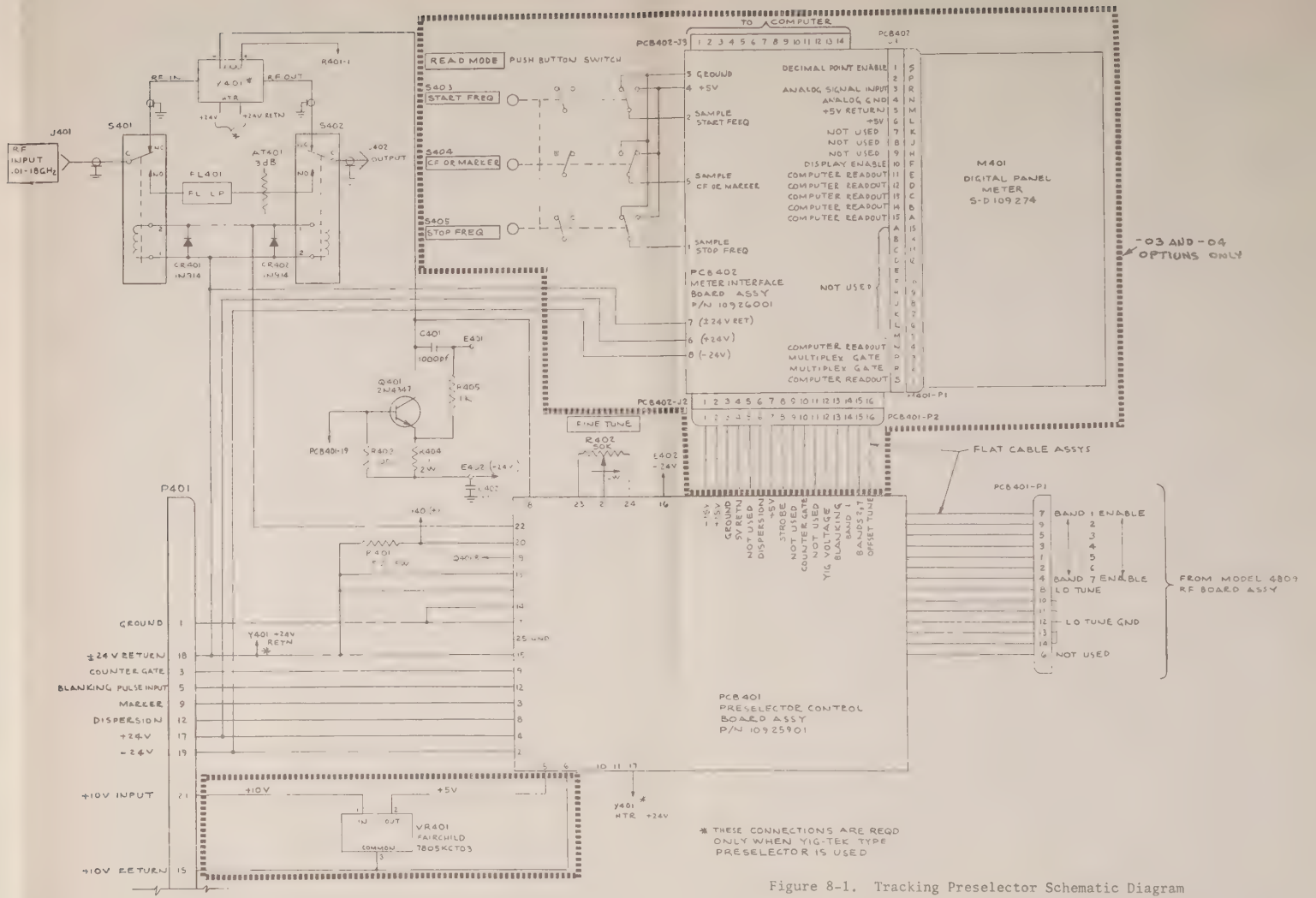
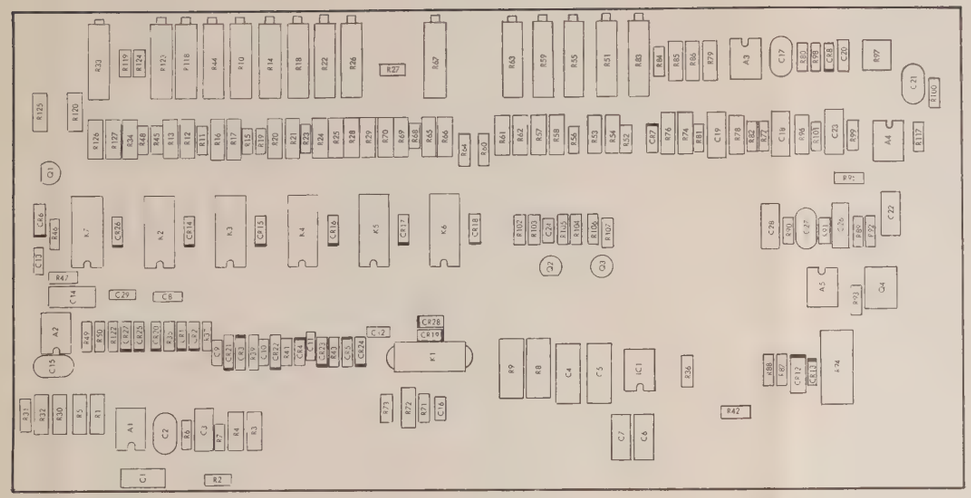


Figure 8-1. Tracking Preselector Schematic Diagram



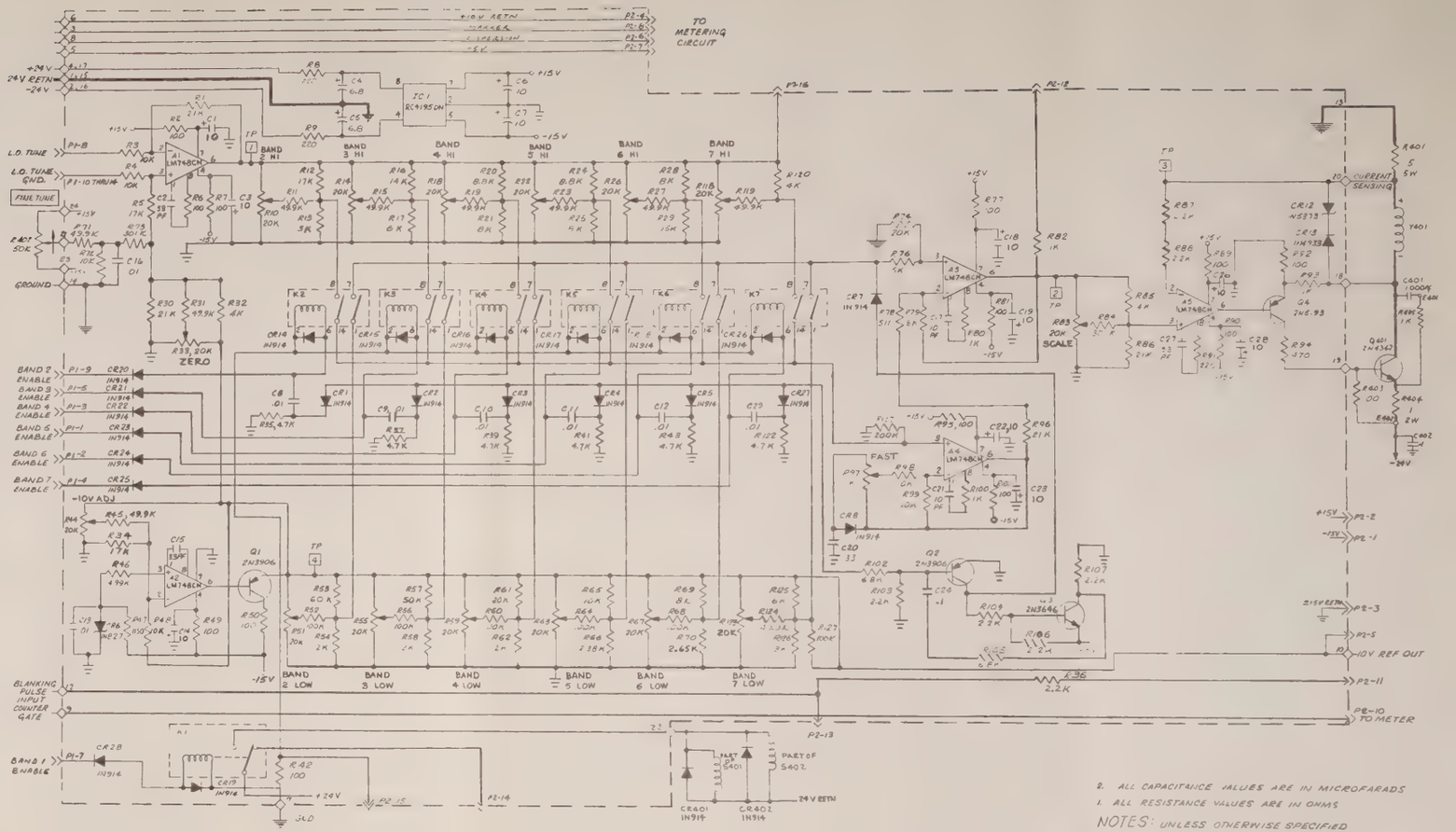
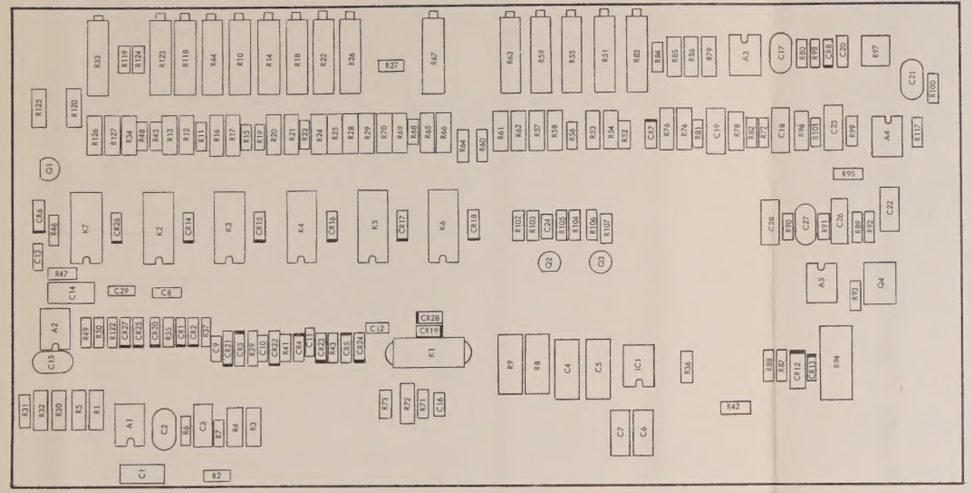


Figure 8-2. Preselector Control Board PCB401, Schematic Diagram



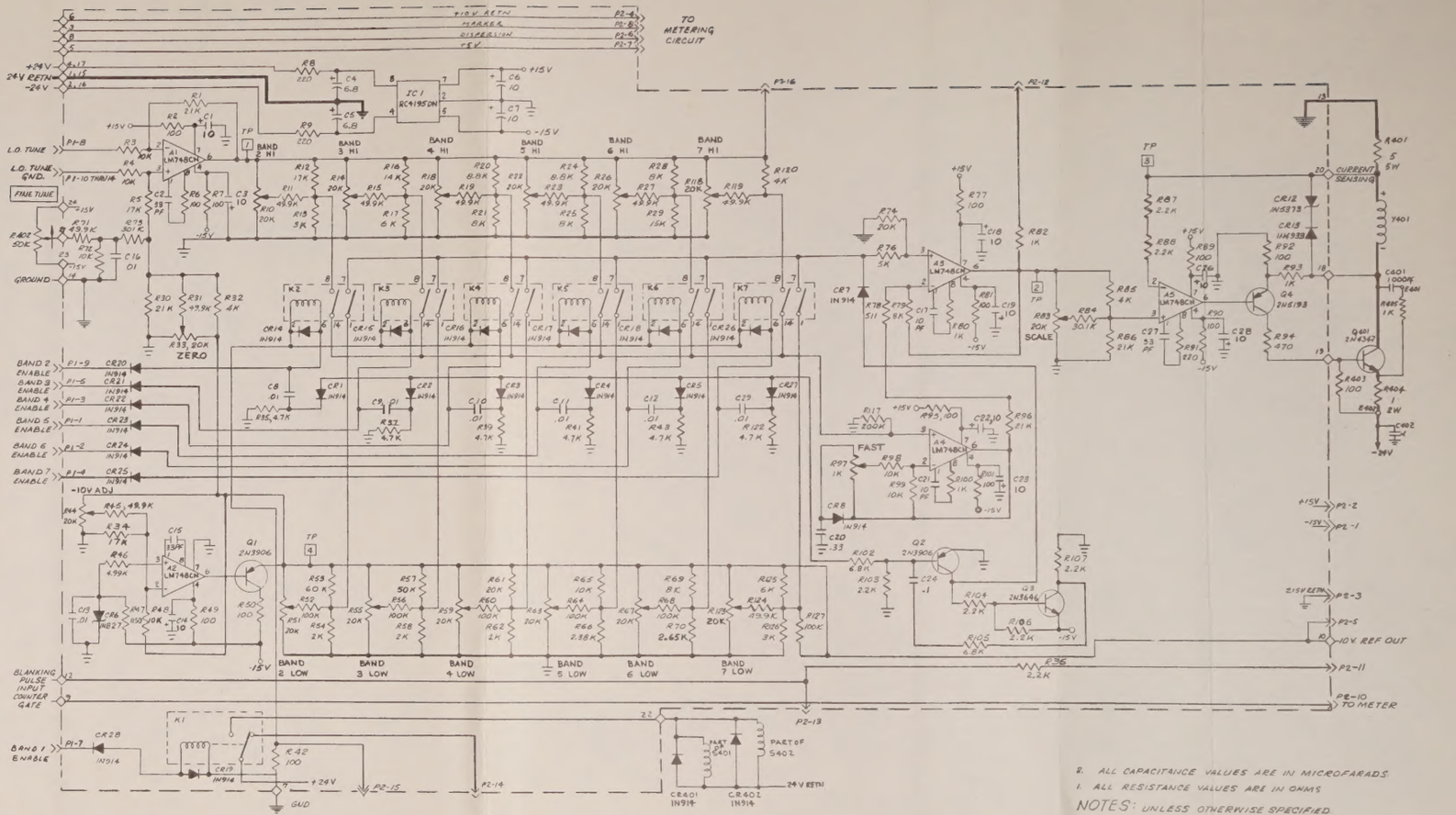


Figure 8-2. Preselector Control Board PCB401, Schematic Diagram

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